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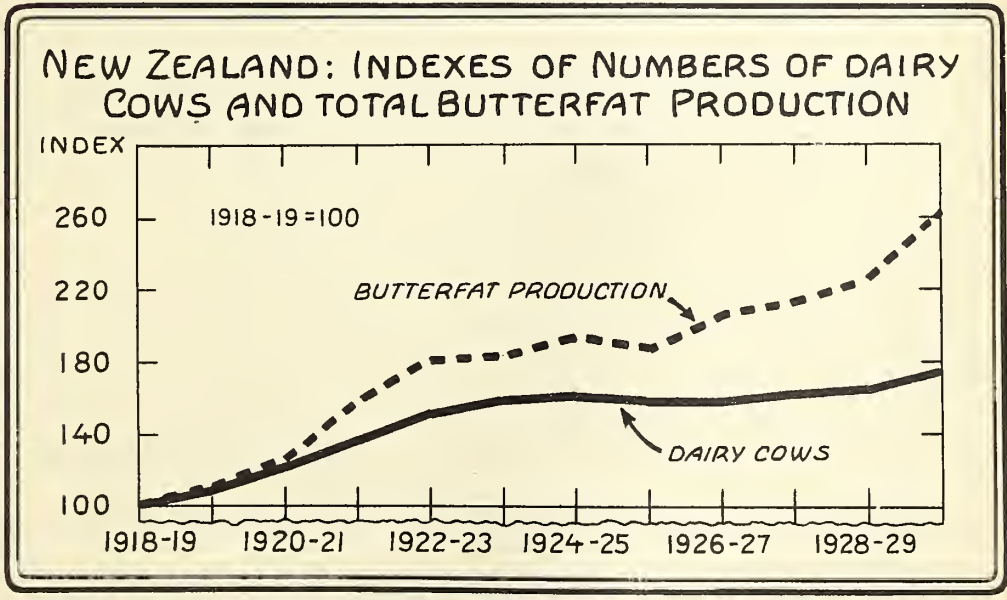
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THE COMPETITIVE POSITION OF THE DAIRY INDUSTRY OF NEW ZEALAND



THE RESULTS OF INTENSIVE PRODUCTION WHICH NEW ZEALAND IS DEVELOPING ARE DEMONSTRATED IN THIS CHART. NUMBERS OF DAIRY COWS HAVE BEEN INCREASING BUT BUTTERFAT PRODUCTION HAS BEEN INCREASING MUCH MORE RAPIDLY

A Message from the Minister of Agriculture.

I firmly believe that New Zealand can become the premier dairy country of the world, not even excepting Denmark. Our climate and soils are exceptional and we can produce dairy produce under conditions which are almost ideal. The progress made in breeding dairy stock; in the improvement of the dairy lands; in the manufacture of butter and cheese, is something to be proud of, but good as has been this improvement, we can do better;—in fact, a long way better than we have done up to date.

Improved feeding, combined with testing of the herds, is, I am sure, the practice that will lead to a still greater success. More production per acre should be the watchword and if New Zealand dairymen take this matter up with the determination and enterprise they have displayed in other departments of the industry, then we need not fear competition even from the Danes.

I hope the Coming Year will be one of rich profit to all engaged in the industry.

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THE COMPETITIVE POSITION OF THE DAIRY INDUSTRY OF NEW ZEALAND

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INTRODUCTION

New Zealand is predominantly a pastoral country uniquely adapted to dairying. In contrast with Danish dairying, which is largely dependent upon cultivated feed crops, both home-grown and imported, New Zealand dairy production is maintained primarily on permanent pasture lands with relatively slight dependence upon supplementary forage, ensilage, and root crops.

Originally New Zealand was given over to the grazing of sheep and cattle with dairying carried on in a more or less desultory way as a relatively unimportant side-line, but now a dairy industry is maintained which, in value of output and export, is approaching first place among the country's agricultural enterprises. Sheep-raising with attention to both mutton and wool production is still first in importance in total value. The only major farm enterprises competing with dairying are the production of wool and meat. Crops like grain and pulse (leguminous plants, such as peas, etc.) occupy not more than 3 per cent of the entire cultivated area and even this area is localized, some 70 per cent of the grain produced in the Dominion coming from Canterbury. Of the few alternatives to dairying thus open to New Zealand farmers in the exploitation of their agricultural resources, sheep-raising remains by far the most important. Beef-raising is limited not so much by lack of resources for production as by disadvantages in export marketing. Beef marketed across the equator some 12,000 miles from where it is produced requires freezing during shipment. This frozen

beef is so discounted in competition with fresh or chilled beef in the British market as to cause serious difficulty in the development of the beef industry in New Zealand. Fully three-fourths of the beef produced in that country is for the domestic market. Argentine beef can be shipped so as to reach Great Britain as "chilled" rather than "frozen" meat with resulting advantage to the Argentine beef-grower. Mutton, on the other hand, which must be shipped in a frozen state from any part of the Southern Hemisphere is produced in New Zealand chiefly for export at no disadvantage in this respect.

The number of sheep in New Zealand is now the highest on record and is apparently still on the increase. But along with the continued increase in sheep-growing, there has been an equally marked growth in the dairy industry. This simultaneous expansion of sheep-raising and dairying is probably more significant than any other development in New Zealand agriculture at this time, indicating as it does the general intensification of agriculture in that country. During the earlier, more extensive, phase of their development, sheep-raising and dairying were true alternatives, expansion in one tending to result in decline in the other. The recent expansion in both of these major enterprises is being accomplished mainly by improvement in the carrying capacity of pasture lands and in the quality of stock carried.

The exploitation of the agricultural resources of New Zealand is shifting from extensive operations to increased production by more intensive methods. This is particularly true of dairying. More attention is now being directed by New Zealand dairy leaders to increasing the carrying capacity of established pasture lands by means of top-dressing and generally better care, increasing the yield per cow by means of cow-testing and culling, supplementary feeding and other methods of lengthening the lactation period, and care in selecting calves for replacing cows in the milking herds. Greater economy in the utilization of by-products such as skim or buttermilk through growing of calves and pigs is also being stressed, as well as general improvement in quality of product and methods of marketing.

Dairying now contributes one-third of the net value of all primary production in New Zealand. The proportion during the last years before the war-time expansion of the dairy industry was not more than one-sixth. Milk production has now reached approximately 8,000,000,000 pounds a year, which is about the same as the production in the Netherlands, more than one-half as much as the output of Canada, and somewhat more than the combined production of our three Pacific Coast States. A singularly large proportion, fully 90 per cent of the New Zealand milk supply is utilized in butter and cheese production. Approximately 7 per cent is consumed as fresh milk as compared with about 50 per cent so utilized in the United States. Owing to the high degree of specialization in dairy production, with even veal and bacon as yet scarcely established as important by-products, effort is concentrated mainly upon the maximum production of butterfat for export as butter and cheese.

There is now practically one cow in New Zealand to every person, whereas 20 years ago the ratio was one cow to two persons. Consumption of butter in New Zealand is already higher, on a per capita basis, than in any other country in the world and the per capita consumption of all milk and milk products in terms of their milk equivalent exceeds that of the United

States. But the total population is only 1,500,000 and the rate of increase has been slowing down until in the last year for which data are available (1929) the increase was only 17,442 or 1.24 per cent. There is little indication, accordingly, that increased domestic consumption may be expected soon to affect materially the New Zealand surplus.

In the relation between agriculture and industry in New Zealand the predominance of agriculture is of prime importance in determining the ratio between production and surplus of dairy products. Of the total wealth produced in New Zealand, primary production now provides more than two-thirds, a proportion not much different from that of 25 years ago. Any industrial development in prospect can affect so slightly the domestic consumption that exports will represent closely the output, and material expansion of the dairy industry will add by nearly an equal amount to the exportable surplus of dairy products.

Adjustments are now being made by New Zealand dairy interests to meet their international competition through various means, all of which contribute to the improvement of their natural resources and the further cheapening of production. New Zealand is now second only to Denmark in milk equivalent of dairy produce exported and it appears certain that in the near future the New Zealand surplus will exceed that of Denmark in quantity.

The current price depression, since it affects pastoral products generally, may not restrict dairy production in New Zealand. Export prices of dairy produce averaged 21 per cent higher during 1930 than during 1909-1913, while wool averaged only 1 per cent higher, and by January, 1931, these prices were represented by an index of 99 for dairy produce and 62 for wool. With attention already having been turned in the direction of increased production per cow and per acre, reduced prices for dairy products will tend to be met by advancing along these same lines.

Effort is being exerted through the concerted action of New Zealand dairy interests to secure the most profitable disposition of their growing surplus, especially of butter, by developing new markets alternative to Great Britain, the long-established main outlet. Direction of shipments by the Dairy Produce Control Board makes possible the protection of prices in the principal market through diversion of supplies to a wider range of markets, including Canada and the United States, than would be feasible under strictly private initiative. Centralized control provides the incentive for regarding the returns to the industry as a whole through relief of the pressure upon the British market, which incentive would be lacking were individual shippers and organizations seeking at all times their own interests independently of each other. It is apparent that this is a factor operating in connection with actual price and tariff differentials in the recent shift in butter exports to North American markets, first to the United States and then to Canada. Whatever form New Zealand competition may take in the markets of the United States, the surplus from that source may be expected to continue to affect our markets directly or indirectly.

GENERAL DESCRIPTION

The Dominion of New Zealand comprises two large and several groups of small islands in the South Pacific which altogether have a total land area of 66,390,262 acres and a population (April 1, 1930) of 1,548,897. Thus sparsely populated and isolated by 12,000 miles from her principal market in Great Britain, with fertile soil, and a moist, mild climate, New Zealand has developed, through geographic and economic influences combined, into a primary producing country dependent chiefly upon foreign countries in the marketing of its agricultural products.

Much has been written in glowing terms of New Zealand climate, characterizing it as nothing less than ideal for dairying. The exceedingly favorable natural conditions such as abundant moisture and mild temperature with pasture growth throughout the year have been so often referred to that the advantages have probably been exaggerated. A true picture of the dairy resources of this region cannot be drawn with all light and no shadow. Among the drawbacks in the New Zealand climate and the system of dairying that has grown up in adjustment to it, several should be noted as of real importance.

The cold winter rains are harmful to unsheltered stock, and tend to make pastures wet and soggy and easily damaged by the trampling of cows at pasture. The less rainy but always moist and cool summers are conducive to grass-growth, but at the same time are generally unsuitable to the growing of supplementary grain crops and are particularly detrimental to the curing of hay. Since the cutting of surplus grass for curing is not usually practicable, it is the more general practice to handle the clipped grass and any other green fodder crops as ensilage. Such ensilage is commonly stacked and fed in the open fields.

As a result of such direct dependence upon pasture growth, dairy production in New Zealand is highly seasonal and sensitive to even minor changes in weather conditions. Even at the height of the dairy season, about Christmas time, pastures may become dry enough to create a temporary scarcity of green feed. Normally, three-fourths of the butter and cheese output for the year is obtained during the six months from the first of October through March.

From year to year the dairy output of New Zealand has been remarkably steady in its growth. An entirely bad season is a rare occurrence. Accordingly, the usual practice is to stock the farms to their full carrying capacity. Under such conditions, with little housing or supplementary feed provided for stock, any bad weather or shortage of pasture even of short duration is more serious in its consequences than would otherwise be the case. Accordingly, the condition of the cows at the end of the winter season becomes a matter of significance as well as the spring condition of pastures, as affecting the prospects of a new dairy season. Winter housing is being urged by dairy leaders as a means of preserving pastures from trampling by cattle during a wet winter, as well as keeping cows in better condition.

As a result of the heavy rainfall, seriously unsanitary conditions often exist in and around the milking sheds where proper drainage is difficult and where crude methods persist either because of negligence on the part of farmers themselves or the retarding of improvements as an effect of the system of share-milking. A far more liberal use of concrete in cow-yards is urgently recommended by New Zealand dairy leaders and they are hoping for improvement through the recent inauguration of a national system of dairy farm inspection.

A great advantage to New Zealand, as affecting its competitive position, arises from its location in the Southern Hemisphere in that the seasons are complementary to our own. Accordingly, shipments of New Zealand dairy produce, in so far as they follow the natural seasonal trend of production, reach European and North American markets during their periods of lightest supply and highest price.

As early as 1892 the New Zealand Yearbook carried this prophetic statement: "New Zealand may claim to be the Denmark of the South, without ever having to enter into competition with the Denmark of the North, for the reason that our seasons are opposite. *** The luxuriance of the pastures has to be seen to be appreciated. Large tracts of bush-lands are being thrown open for small settlements, and are eagerly taken up for the most part by thrifty, hard-working men. Land is procurable either by purchase, deferred payment, or perpetual lease, on easiest terms. Homes are being built up in all directions with dairying for the chief industry. The very nature of the industry renders it peculiarly suited to small selectors".

In a broad general comparison the climate and agricultural resources of New Zealand and of our Pacific Coast States are similar. Lying in the Southern Hemisphere in about the same latitude as that of the Pacific Coast States in the Northern Hemisphere, New Zealand's seasons are nearly opposite to those of our Pacific Coast States. In both sections the ocean-tempered climates are similarly equable. The monthly mean temperatures are closely similar, with the same characteristic narrow range within the year. The parallel is generally less close as to rainfall as New Zealand summers are comparatively wet, although both regions have heavy winter rains. The northernmost and higher parts of the Pacific section correspond with the South Island of New Zealand, while the climatic conditions prevailing in the North Island of New Zealand resemble those of the lower and southern parts of our coastal region on the Pacific. Wellington, which represents about the climatic mean for New Zealand, compares more closely with Portland in rainfall and with San Francisco in temperature, as indicated in Table 1, the averages being derived from the entire period over which meteorological data have been recorded.

Table 1.- Monthly means of temperature and rainfall in Wellington, New Zealand, and points in the coastal region of the United States, by months 1/

Mean temperature

Month	Wellington	San Francisco
	Degrees Fahrenheit	Degrees Fahrenheit
Jan. . . .	62.5	49.9
Feb. . . .	62.5	52.2
Mar. . . .	60.5	54.2
Apr. . . .	57.0	55.0
May	52.7	56.8
June	49.4	58.5
July	47.7	58.5
Aug. . . .	48.6	59.1
Sept. . . .	51.6	60.9
Oct. . . .	54.4	60.5
Nov. . . .	56.9	56.3
Dec. . . .	60.4	51.5
Year . . .	55.4	56.1
Range of monthly means	14.8	11.0

Mean rainfall

Month	Wellington	Portland
	Inches	Inches
Jan. . . .	5.3	6.6
Feb. . . .	3.2	5.4
Mar. . . .	3.3	3.9
Apr. . . .	3.8	2.9
May	4.8	2.2
June	4.9	1.5
July	5.5	.6
Aug. . . .	4.4	.6
Sept. . . .	4.0	2.0
Oct. . . .	4.2	3.1
Nov. . . .	3.4	6.1
Dec. . . .	3.3	6.7
Year . . .	43.1	41.6

New Zealand Official Year Book, 1930, and Yearbook of Agriculture, United States Department of Agriculture, 1930.

1/ Normals for the United States for temperature are based on records of thirty or more years of observations and for rainfall on records of twenty or more years of observations.

In extent and productivity of the dairy industry the two areas are not at present greatly dissimilar as indicated in Table 2 below. In the utilization of the milk supply and the marketing of the products, however, very little similarity exists.

In the acreage devoted to agriculture, New Zealand has about 80 per cent of the area of the three Pacific Coast States whereas in dairy cows the relation is reversed, the Pacific States together maintaining about 80 per cent (in 1924) of the numbers in New Zealand. The yield per cow in the Pacific States is considerably higher than in New Zealand, averaging 5,232 pounds and 4,644 pounds, respectively. The comparison emphasizes the tendency in New Zealand toward a medium yield per cow and a large output per acre and per farmer, -- toward greatest economy, that is, in the labor element of cost. The following comparative statement is based on official figures for New Zealand, as of 1924 and preliminary reports of the United States census covering the same year.

Classification of Agricultural Lands in New Zealand in 1924

Utilization of land	<u>Acres</u>
Improved	18,510,558
Unimproved	25,121,814
Total occupied	43,632,372

Farm land in Washington, Oregon and California, 1924

Land in farms	<u>Acres</u>
Washington	12,608,234
Oregon	14,120,043
California	27,565,440
Total, Pacific Section . . .	54,293,717

The extent to which the agricultural lands of New Zealand are maintained as improved grass lands is shown statistically elsewhere in the discussion that follows.

Table 2.- Number of dairy cows and milk production in New Zealand and in the Pacific Section of the United States, 1924

Country or section	Dairy cows or cows milked	Milk production	
		Total	Average yield
	Number	Pounds	per cow Pounds
New Zealand	1,292,000	1/ 6,000,000,000	1/ 4,644
Pacific Section . . .	1,023,174	5,353,000,000	5,232

Data from New Zealand Yearbook, 1926, and United States Bureau of the Census, 1925.

1/ Estimated.

In the utilization of the milk output, the two sections compare in a way that is characteristic of an outlying surplus-producing area on the one hand and a comparatively urbanized area with a localized market on the other. (Table 2) Accordingly, New Zealand produces butter and cheese, principally for export, while the Pacific States supply fresh milk, primarily, with the manufacture of butter and condensed milk secondary in importance and chiefly for the local market.

Agricultural Resources and Alternative Farm Enterprises

Land now occupied in New Zealand comprises just two-thirds of the entire area while about 5 per cent of the occupied land is barren or incapable of being put to profitable use. The high proportion of unoccupied land is largely owing to the mountainous character of the islands. Mountains occupy approximately one-tenth of the surface of the North Island, and the South Island with the Southern Alps running almost its entire length has a still greater mountainous area. Table 3 covering the occupied area, only, serves to show the utilization of such land under present conditions.

Table 3.- Utilization of occupied land in New Zealand 1919-20 and 1928-29

Use and condition	1919-20	1928-29
	<u>Acres</u>	<u>Acres</u>
Orchards, market gardens, vineyards, nurseries, and seed-gardens	37,360	31,271
Private, for residence, outbuildings, gardens, etc.	56,837	73,263
Plantations (not native bush)	54,563	293,911
Fallow	81,760	117,944
Crops	1,648,991	1,746,200
Sown grasses	16,125,265	16,855,512
Total area in cultivation	18,004,776	19,118,101
Tussock and other native grasses	14,892,113	14,131,630
Standing virgin bush	4,558,943	3,883,805
Fern, scrub, and second growth	3,722,367	4,016,774
Phormium tenax (native flax)	49,867	62,704
Barren and unproductive	2,245,013	2,309,117
Total unimproved	25,468,303	24,404,030
Total area occupied	43,473,079	43,522,131

Statistical Report on the Agricultural and Pastoral Production of the Dominion of New Zealand for the season 1919-20 and 1928-29.

The relative unimportance of crop lands in New Zealand is evident in Table 3. Crop-raising is now carried on in that country to such an extent only as to provide the feed necessary to supplement pasture, (as turnips, mangolds, and green fodder crops) and grain for local consumption. Wheat is now imported in most years to supplement domestic production. In the eighties wheat was an important export product, but with the introduction of refrigeration and the impetus given to dairying and meat production for export, the

wheat surplus has given place to a deficit except in unusually favorable crop years. The yield per acre is exceeded by few countries, averaging over 36 bushels in several recent years. Only in occasional years is there any surplus of crops for export with the notable exception of grass-seed or other seed. Cash crops are relatively unimportant in New Zealand.

There is some tendency for the area given over to cultivated fodder crops to be increased, and the great value of alfalfa is only beginning to be realized. Unquestionably the natural conditions of climate, soil, and water-supply give New Zealand farmers a relative advantage in the growing of the best grass and green fodder crops for livestock production.

With more than 70 per cent of the occupied land in New Zealand given over to the growing of grass, native and sown, and less than 5 per cent to cultivated crops of all kinds, sheep and cattle-raising naturally predominate in the agriculture of that country. Even horses are notably few and declining in number. The greatest number, 404,284, was reported in 1911 and since then the number has fallen rather steadily to 297,195 in 1930. Numbers of the various important classes of livestock maintained during recent years in relation to total areas of land occupied and to the population are shown in Table 4.

Table 4.- Population, area, and number of livestock in New Zealand, 1911, 1923 and 1930

Item	Apr. 2, 1911	Mar. 31, 1923	Jan. 31, 1930
	Acres	Acres	Acres
Area of Dominion	66,390,262	66,390,262	66,390,262
Area occupied	40,238,126	43,653,163	43,368,653
Population, including Maoris, or natives	Number 1,056,199	Number 1,525,301	Number 1,548,897
Cattle	2,020,171	3,480,694	3,765,668
Average number of cattle per 1,000 persons	1,913	2,626	2,431
Average number of cattle per 1,000 acres of occupied land	50	80	87
Dairy cows	633,753	1,248,643	1,440,321
Average number of dairy cows per 1,000 persons	600	942	930
Average number of dairy cows per 1,000 acres of occupied land	16	29	33
Sheep 1/.	23,996,126	23,081,439	30,841,287
Average number of sheep per 1,000 persons	22,719	17,416	19,911
Average number of sheep per 1,000 acres of occupied land	596	529	711
Hogs	348,754	400,889	487,793
Average number of hogs per 1,000 persons	330	302	315
Average number of hogs per 1,000 acres of occupied land	9	9	11

Data from New Zealand Official Yearbook and Census of New Zealand.

1/ Sheep returns as of April 30.

In relation to the total area of land occupied there has been a general increase over the last 20 years in livestock carried, as pointed out elsewhere in the discussion of improvement in carrying capacity of pasture lands. The table indicates also that while the number of sheep per 1,000 acres has been more than maintained over this period, the number of cattle has increased much more than sheep and the relative number of dairy cows much more markedly than either.

Long before there was a dairy industry of commercial importance in New Zealand, millions of sheep were being grazed in that country, and the present number of sheep (nearly 31,000,000 as of April 30, 1930) is greater than at any time in the history of the industry. The relatively poor pasture is given over to sheep-raising while cattle, particularly dairy cattle, generally occupy the more productive lands, the margin between sheep and dairy land tending to shift with relative returns from sheep-raising and dairying. In the period of rapid expansion of the dairy industry following the World War, for example, much of the best sheep land was bid up in price and taken over by dairy farmers. More recently there has been a tendency in the opposite direction with marginal dairy land reverting to sheep-growers.

Although sheep-raising is thus alternative to dairying in the utilization of land, it is not to be concluded that one can not be increased except in proportion as the other decreases. The total dairy output is now being affected more by increased production per cow and per acre than by increase in numbers of cows or in area devoted to the grazing of dairy cows. (See Tables 12 and 13) During recent years, accordingly, improvement in the carrying capacity of land and other methods of intensification have resulted in an increased output of sheep products and dairy products simultaneously.

No apparent relation exists between absolute price changes (export value) and increase or decrease in output either in wool or butter alone. In fact, the increases in both sheep and dairy products have come about more largely under falling actual prices with decreases under rising prices. More significant is the relationship or ratio between wool prices on the one hand and butter prices on the other. The important factor is not actual price changes but relative price changes. Over a long period of years the value of a pound of butter has tended to exceed slightly the value of a pound of wool when comparison is made on the basis of the average export values of butter and wool. But this ratio has varied from year to year and with various periods of years from an almost exact parity to a ratio of 3 to 1 in favor of butter, that is, 1 pound of butter bringing as much as 3 pounds of wool. Since 1921, when it took 3.4 pounds of wool to equal in export value a pound of butter, the values again became adjusted for a time to what may be regarded as a normal parity of about 1 to 1. More recently wool prices have become relatively lower than the record low butter and cheese prices prevailing. Declared values of exports for the entire year, 1930, indicate an average value equivalent to 27 cents per pound of butter and 19 cents per pound of wool, making the average export value of 1 pound of butter equal to the average export value of about 1.4 pounds of wool.

Beef is still grown in New Zealand more largely for domestic consumption than for export. Fully three-fourths of the beef produced is still consumed within the Dominion, whereas Argentina, for example, exports more than three-fourths of its beef output.

Improvement in the technique of refrigerating beef for ocean transportation might do much to open up a profitable export market for New Zealand beef and thereby stimulate expansion in the beef cattle industry. Refrigeration was first successfully applied in ocean transportation of meat from the United States to England in 1874. Later improvement in the technique of refrigeration made possible the shipment through the tropics of dairy products as well as meat. From the first, however, the complete freezing necessary to preserve the New Zealand meats for the comparatively longer trip has left a competitive advantage to beef from Argentina which requires merely chilling for its satisfactory transportation to English markets. Beef held at chilling temperatures rather than at the low temperatures resulting in freezing of the meat is much preferred by the British trade.

Improvements now in progress in the technique of sterilization and refrigeration may tend to reduce the advantage to the countries nearer the European consuming centers and make possible the satisfactory shipments of chilled beef from New Zealand. It is probable that more would depend upon this than any thing else in the development of the potential beef industry in New Zealand. The better quality of the Argentine beef is not only the cause of Argentina's importance as a source of beef supply for Europe, but it is also the effect, as Argentine producers have improved their cattle to meet the demands of their foreign trade. Of course, the availability of domestic supplies of grain and legume feed also gives Argentine beef-growers an advantage in meeting market requirements as to quality of beef...

Mutton, on the other hand, is not successfully shipped from any of the Southern Hemisphere countries in the chilled state, and New Zealand's early lead in mutton trade is still held, notwithstanding the necessity of freezing the carcasses for shipment.

Beef cattle still outnumber dairy cattle in New Zealand as a whole. The proportion of dairy cattle to the total number, according to the 1928 census, was 40 per cent in the North Island and 45 per cent in the South Island. In only two of the twelve land districts of New Zealand (Auckland and Taraniki) does the total number of dairy cattle exceed the total number of beef cattle. This apparent predominance of the beef type of cattle is exaggerated, however, by the inclusion in the statistics of relatively more of the young stock of the beef breeds, owing to the disposal at an early age of all but a small proportion of the calves from dairy cows. It has been rather a general practice to dispose of surplus dairy calves at birth with little or no value realized from them. The situation as to the relative importance of dairy cattle appears to better advantage in comparing numbers of cows and heifers of producing age only. Of all the cows and heifers two years old and over in the entire country, 75 per cent were being kept for dairying in 1929 as compared with 63 per cent in 1918.

Not only is there the tendency toward keeping a larger proportion of cows for dairying, but more attention is being given to the special dairy breeds. For instance, of the total number of bulls two years old and over, the 1918 census showed 15 per cent of Jersey breeding, either purebred or crossbred with a predominating strain of Jersey, while in 1924, the latest year for which census figures are available, the proportion was 43 per cent.

The number of persons employed on New Zealand farms in 1928-29 is officially reported to have been only 138,609. This includes all persons, male and female, who are employed during the major part of their time at farm work whether as employer or employee. The following summary (Table 5) is on the basis of a classification according to the type of farming in which the workers are principally employed. While the grazing of sheep and beef cattle has been well maintained as a major farm enterprise over this period, the relative increase in dairy farming is evident.

Table 5.- Number of persons engaged in various types of farming in New Zealand 1919-20 to 1928-29

Year	Type of farming in which principally employed						Total
beginning	Dairying		Pastoral and		Agricultural		
Aug.	unspecified						
	Number	Per cent	Number	Per cent	Number	Per cent	Number
1919-20	55,695	42.1	60,364	45.7	16,190	12.2	132,249
1920-21	60,942	45.7	54,813	41.1	17,505	13.2	133,260
1921-22	68,661	50.7	48,325	35.7	18,409	13.6	135,395
1922-23	78,564	53.7	49,399	33.7	18,417	12.6	146,380
1923-24	78,145	53.8	52,181	36.0	14,832	10.2	145,158
1924-25	76,976	53.9	51,791	36.3	13,975	9.8	142,742
1925-26	73,370	53.4	50,388	36.6	13,693	10.0	137,451
1926-27	69,801	52.5	49,625	37.4	13,373	10.1	132,799
1927-28	70,573	54.5	45,004	34.8	13,904	10.7	129,481
1928-29	74,686	53.9	49,775	35.9	14,148	10.2	138,609
	:	:	:	:	:	:	:

Data from New Zealand Official Year-book, 1930.

Agriculture in Relation to Industry

Primary production still provides directly more than two-thirds of the wealth of New Zealand, a proportion not much different from that of 25 years ago. (Table 6) Primary production not only provides the great bulk of New Zealand wealth directly, but it determines almost the entire industrial development of the Dominion. Such a large proportion of the industries are engaged in processing primary products (chiefly for export) that they have depended and must continue to depend for expansion upon the growth of the primary industries. Factories for the preparation of meat and dairy products for market constitute the most important group and the net value of their output in 1927-28 was 21.3 per cent of the total net value of all factory

production. 1/ Of a total increase in value of all factory production in New Zealand between the years 1920-21 and 1927-28 amounting to \$41,856,000, meat and dairy products manufactured added a value of \$23,848,000 or more than one-half of the total increase.

Of all the groups of primary products, dairy products made much the greatest increase in value from 1900-01 to 1927-28. Over this period the increase in value has been affected even more by the higher prices than by increased volume of production. The ratio of the value of dairy products to the value of all primary products from year to year is significant nevertheless of relative changes in which the expansion of dairying has been greatest.

Manufacture of other than primary products for international trade is negligible in comparison with primary products on the one hand, and, on the other, with products of sheltered industries such as can not so readily be marketed overseas as in the local market. The local demand, in turn, is dependent in New Zealand principally upon the prosperity of primary producers.

1/ Department of Economics of Canterbury College, Christchurch, "The Development of New Zealand Factory Production," April, 1930.

Table 6.- Net value of production in New Zealand by industries, selected years, 1900-01 to 1927-28

Class or group	1900-01	1905-06	1910-11	1915-16	1920-21	1925-26	1927-28	Percentage of net value of all production, 1927-28
Pastoral.....	1,000	1,000	1,000	1,000	1,000	1,000	1,000	Per cent
Dairying 1/...	55,533	60,835	98,506	157,680	133,833	177,147	162,547	199,533
Agricultural 2/	13,627	16,980	51,147	58,887	125,073	128,480	125,047	157,727
Mining.....	13,140	20,927	19,467	36,987	43,800	40,680	42,827	45,260
Fisheries...	487	18,380	18,493	16,547	16,547	15,087	16,080	17,033
Forests.....	487	487	975	1,460	1,947	2,920	2,432	2,433
Total primary production..	10,220	12,573	12,547	12,552	27,253	32,606	27,740	15,574
Manufacturing	110,830	125,780	104,927	84,212	348,452	397,120	377,555	417,560
Building, etc.	25,793	51,147	39,420	47,207	92,954	108,527	112,420	167,553
Total secondary production..	18,980	24,820	28,227	29,200	44,773	58,886	65,700	65,753
Gross total..	44,773	50,967	67,347	76,407	137,127	167,415	178,120	171,306
Net value..	155,735	181,747	202,680	360,820	485,180	564,533	551,775	528,865
Primary production as percentage of total.....	71.2	70.8	73.2	78.8	71.7	70.3	68.0	70.9
Dairy production as percentage of total primary production..	12.5	14.0	16.6	20.7	35.9	32.5	33.4	33.0
Dairy production as percentage of total primary production..	8.8	9.9	12.2	16.2	25.7	22.8	22.7	25.4

Data from New Zealand Official Yearbook, 1929, p. 955.

1/ Includes poultry and bees. 2/ Exclusive of crops fed and of grass-seed not exported.

Production and Utilization of Milk

The total production of milk in New Zealand can be estimated with fair accuracy at 6,600,000,000 pounds for the 1926-27 season, or just one-half as much as the Canadian production as officially estimated for 1927 at 13,060,000,000 pounds. ^{2/} Of the total New Zealand output, however, a singularly large proportion is utilized in manufacture, chiefly butter and cheese (Table 7)

Table 7.- Estimated production and utilization of milk in New Zealand, 1926-27

use	Estimated quantity of milk Pounds	Proportion of total output Per cent
Consumption as fresh milk and cream:	460,690,000	7.0
Feeding on farms, waste, etc	206,893,000	3.1
Condensing and drying	96,908,000	1.5
Cheese-making	1,675,433,000	25.5
Butter making: in creameries	4,006,941,000	60.9
on farms	134,421,000	2.0
Total	6,581,286,000	100.0

Figures representing quantities of milk used in manufacturing are derived in this calculation from the quantity of butterfat reported, as received from suppliers at manufacturing establishments for various uses, as published in Statistical Report on the Factory Production of the Dominion of New Zealand for the year 1926-27, Census and Statistics Office, Wellington. The average butterfat content of all milk for cheese-making was reported as having been 3.95 per cent, which is assumed to have been the average for the total milk supply, since milk for cheese-making does not come from any definitely localized areas and much of the cheese is made in dual factories equipped for the manufacture of butter and cheese. A pound of butterfat is thus taken as the equivalent of, or as derived from, 25.44 pounds of milk.

On the basis of a semi-official estimate that 7 per cent of the total milk production is directly consumed as fluid milk, the figures representing the quantity thus utilized and total milk yield were arrived at by taking the reported receipts of butterfat at all manufacturing establishments together with the probable wastage and requirements for feeding dairy calves as representing 93 per cent of the total. If calculated on the basis of an average yield from 1,303,225 dairy cows of 198.5 pounds of butterfat (the officially estimated yield per cow) or 5,050 pounds of milk, assuming an average fat content of 3.93 per cent, the total milk yield thus arrived at for the 1926-27 season was 6,581,000,000 pounds. The two methods of

^{2/} See similar study of "The Competitive Position of the Dairy Industry of Canada," United States Department of Agriculture, Bureau of Agricultural Economics, Division of Statistical and Historical Research, F.S.40, published in August, 1929.

calculation give a very satisfactory check each upon the other as may be seen by the comparatively small indefinite item including feeding and waste in the statement above.

Of the total milk yield in that year, approximately 7 per cent was consumed directly as fluid milk in New Zealand as compared with approximately 37 per cent so used in Canada and 47 per cent in the United States. The relative unimportance of the fluid milk market in New Zealand is accounted for by the small number of consumers, roughly one person to each cow milked, and to the light consumption per person. The average daily consumption per capita of the total population of New Zealand proper, is apparently less than one-half pint per day, or 38 United States gallons per year, which compares rather unfavorably with that of approximately 51 gallons in Canada and 55 gallons in the United States.

Calf-feeding, under prevailing conditions of disposal of dairy calves, requires a relatively small quantity of whole milk. This item may be estimated roughly at 33 million pounds of milk in 1926-27, or about one-half of 1 per cent of the total yield.

The quantity of condensed and powdered milk manufactured in New Zealand is regarded as confidential information. The official report referred to above, however, provides the basis for calculating this item from the quantity of milk supplied to manufacturing establishments for condensing. These figures indicate an output in that year equivalent to approximately 39 million pounds of condensed milk, or 12 million pounds of powdered milk. The bulk of the condensed and powdered milk is produced for the export market. Exports during the last five years, 1925-1929, have averaged 12 million pounds of powdered milk and 1.5 million pounds classified as "milk and cream, preserved, condensed, etc." The powdered or dried milk trade received its greatest impetus in the early war years through the demand created in Great Britain.

Ice-cream manufacture, reported for the first time for the year ended March 31, 1928, amounted in that year to 273,546 imperial gallons or 328,097 United States gallons. This would provide not more than a quart per person per year, indicating how negligible is this use of milk and cream. Utilization of skim milk in the casein industry compensates to some degree for the lack of a pig industry or calf-rearing. During the year 1930, exports of casein amounted to 6,419,000 pounds, the heaviest exportation on record.

The value of all dairy products manufactured in New Zealand establishments during the year ended March 31, 1927, is reported officially as having been 19,021,378 pounds Sterling (equivalent to \$92,579,480), of which butter constituted two-thirds in value and cheese and other products one-third. (Table 8)

Table 8.- Value of various dairy products manufactured in New Zealand, 1926-27

Product or group	Value	United States equivalent par value	Percentage of total value
	£	Dollars	Per cent
Butter (including whey butter):	12,537,074	61,017,939	66
Cheese	5,566,650	27,092,886	29
Other products	918,154	4,468,655	5
Total	19,021,878	92,579,480	100

Of the 257,996,539 pounds of butterfat delivered to manufacturing plants during the 1928-29 season, 69 per cent was used for butter making, 29 per cent for cheese, and 2 per cent for dried and condensed milk, according to American Vice Consul William P. Cochran, Jr., in a report from Wellington, as of August 25, 1930.

Butter-making is carried on principally, and cheese-making rather exclusively, in factories. Farm-made butter still provides a comparatively small but stable supply of some importance for the farmer and his family. For the entire rural population the farm butter produced amounts to about 10 pounds per capita which is about one-third of the average per capita consumption for the country.

In the manufacture of butter and cheese, large scale production in cooperatively owned plants is the rule. Of 500 establishments in operation in 1928, 441 or 88 per cent were cooperatively owned. Consolidation is still in progress as indicated by a gradual decline during recent years in the number of plants together with a steadily increasing total production. In the year ended March 31, 1928, official reports show that the 500 factories in operation at the end of that period had utilized 234,426,450 pounds of butterfat in the production of butter, cheese, and other dairy products valued at 21,860,276 pounds Sterling, an average per plant equivalent to \$212,788. The number of suppliers as of December 31, 1927, at the peak of the manufacturing season, was 55,947 or about 112 to the factory.

Butterfat sold for butter-making is separated principally on the farms and supplied to factories as cream, while for cheese-making, of course, the whole milk is supplied. The predominance of the practice of separation of butterfat at the farm is shown by reports of milk and butterfat received by manufacturing establishments. (Table 9) For butter making, the fat separated at factories averaged during recent seasons some 5 per cent of the total quantity received.

Table 1.- Butterfat received by manufacturing establishments and quantity of butter and cheese produced in New Zealand, years ended March 31, 1926-1928 and by districts, 1928

Provincial district	Number of Butterfat			Butterfat			Butterfat			Total butterfat		
	manufactured for:	Butter	produced	received	for cheese	cheese	received for:	all other	suppliers	received from	all other	suppliers
	using as butter	1/		making	produced		uses					
	establishments											
		Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Auckland	111	99,304,775	120,741,600	10,205,142	26,368,944	2,414,982	111,924,399					
Hawke's Bay	25	6,325,617	7,763,203	3,155,016	8,406,608	8,909	9,529,542					
Taranaki	116	14,050,524	18,466,448	27,170,781	72,228,128	49,771	41,271,076					
Wellington	83	24,172,658	29,514,192	11,757,122	30,646,224	503,769	36,833,549					
Marlborough	8	1,463,517	1,820,672	661,963	1,712,368	3,394	2,128,874					
Nelson	11	2,698,319	3,277,792	425,596	1,092,560	17	3,123,932					
Westland	11	1,313,263	2,178,848	56,593	140,010	2,503	1,872,359					
Canterbury	39	7,634,572	9,416,176	1,858,078	4,934,364	16,559	5,505,609					
Otago	23	5,040,725	6,215,328	2,017,114	5,266,352	25,952	7,083,791					
Southland	65	2,151,679	2,863,392	8,402,065	22,814,512	595,075	11,148,819					
Total 1928	500	164,655,649	202,662,656	65,749,470	173,610,080	4,021,331	234,426,450					
Total 1927	507	157,505,552	194,501,888	65,858,234	175,193,512	3,805,287	227,173,073					
Total 1926	518	140,232,524	173,008,864	63,689,947	170,258,925	1,439,054	207,048,921					

Data from Statistical Report of the Factory Production of the Dominion of New Zealand for the year

1927-28, pp. 56 and 57.

1/ Including small quantities of whey butter.

Consumption as Affecting Exportable Surplus

Pastoral New Zealand, with its population of 1,500,000, is primarily an exporting country. The United States has 82 times as many people as New Zealand, probably 16 times as many dairy cows, twice as many sheep, and 100 times as many hogs. The marked difference, as affecting the balance between production and consumption of dairy products in the two countries, is also indicated by a comparison of ratios prevailing between population and milk cows in the two countries. In the United States there are practically 5.5 persons to each cow milked. In New Zealand the ratio is now almost exactly 1 to 1.

In contrast with the United States, which is unique in its closely balanced production and consumption of dairy products, New Zealand now depends upon foreign markets for the disposal of fully three-fourths of its dairy output and the proportion going into this "surplus" must increase with increasing production. The net importation of dairy products into the United States, averaging during recent years the equivalent of approximately 1,000,000,000 pounds of milk or only about 1 per cent of out total consumption, almost equals the entire New Zealand consumption of approximately 1.6 billion pounds, annually.

New Zealanders have always consumed heavily the meats so abundantly at hand in that pastoral country. The difficulties met prior to the development of refrigeration in shipping mutton and beef across the equator to European markets so isolated New Zealand stock growers as to cause them to depend chiefly upon the export sale of wool, hides, and tallow with great quantities of meat as something of a cheap by-product. This undoubtedly exerted a profound influence in determining the food habits of the New Zealand people.

During the 5-year period ended March 31, 1929, the most complete available figures covering slaughterings in the abattoirs and on farms together with exports for the same period indicate that 78 per cent of the beef produced was domestically consumed. Similar calculations for the 10-year period ended March 31, 1924, show 70 per cent consumed within the Dominion. Domestic consumption of mutton accounted for 44 per cent of the sheep slaughtered and 7 per cent of the lambs in the five years, 1925-1929, against 40 per cent and 13 per cent, respectively, in the ten years 1915-1924. Domestic consumption of pork has left a quite negligible portion for exportation until in very recent years when the export trade in pork products has amounted to more than a tenth of the production. This export trade is a source of revenue of some importance to dairy farmers.

Consumption per capita of all meats (exclusive of poultry) is fully twice as heavy in New Zealand as in the United States. Consumption of cheese is comparatively light, only slightly more than in the United States, and is almost entirely confined to the domestic Cheddar cheese, there being practically no importation of foreign varieties as in this country. Per capita butter consumption, officially estimated to have averaged 34 pounds

in recent years, is very heavy, certainly exceeding that of any other country and twice that of the United States. (Table 10)

Table 10.- Per capita consumption of meats and dairy products in New Zealand, 3-year averages, 1921-22 to 1928-29

Period	1/ Butter	2/ Cheese	3/ Condensed milk	4/ Fresh beef	5/ Fresh mutton	6/ Fresh lamb	7/ Fresh pork	8/ Ham and bacon
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
3-year average:								
1921-22 to 1923-24	25.89	4.20	2.65	154.08	59.09	16.13	15.76	8.81
1922-23 to 1924-25	27.34	5.82	2.77	156.81	88.61	9.72	28.17	11.04
1923-24 to 1925-26	30.34	5.82	-	208.59	56.13	13.01	30.58	13.32
1924-25 to 1926-27	27.13	4.95	-	184.00	74.64	13.30	19.00	14.74
1925-26 to 1927-28	34.11	5.73	-	174.77	59.43	11.81	14.68	15.88
1926-27 to 1928-29	34.05	7.24	-	167.41	75.32	10.83	16.45	15.60
1928-29 to 1929-30	34.24	7.91	-	155.73	75.68	11.19	13.11	14.51

New Zealand Official Year Books, 1925-1931.

1/ In order to minimize the effect of fluctuations from year to year, particularly in exports and stocks on hand at the end of the year, calculations were made to cover an average of three years in each case.

The average consumption per person in New Zealand of milk and milk products in all forms exceeds materially the per capita consumption in the United States. While the consumption of milk as such is not more than two-thirds as heavy, and cheese consumption is only slightly heavier, practically twice as much butter is consumed. The milk equivalent of all dairy products consumed per person is probably greater in New Zealand than in the United States. Calculations based on the 1926-27 season indicate that milk and milk products equivalent to some 1,100 pounds or 123 United States gallons of milk per capita were consumed within New Zealand, which exceeds the most liberal estimates of total per capita consumption in the United States.

Statistics of production and exportation of butter and cheese indicate that in 1906 some 73 per cent of these products 5/ was sold outside the country whereas by 1928 the proportion had risen to approximately 80 per cent. Of the total milk production of New Zealand as estimated for the 1926-27 season, only about 24 per cent can be calculated to have been utilized in various forms in domestic consumption.

Until very recently consumption of dairy products within New Zealand had been increasing rather steadily as the result of increase in population as well as an increase in average quantity used per person. Production, however, is increasing at a much more rapid rate so that the proportion of the output going to the export market as surplus is continually becoming larger.

5/ Figured on the basis of the combined equivalent in milk and using 3-year averages centered on the stated year as best representing the normal production and exportation.

This it must continue to do. The rate of increase in population (Table 11) is now slower than at any time since the war and is at most but 20 to 30 thousand persons per year. Consumption per capita, particularly butter, can hardly be expected to increase materially, if at all.

Table 11.- Population: Official estimates and rate of change,
New Zealand, 1914-1928

Calendar year	Population, excluding Maoris 1/				
	Increase or decrease during year:		Average		
	Total	Total	Percentage	for current and	
	Number	Number	Per cent	preceding year	
				Number	
1914	1,095,994	11,332	1.04	1,090,352	
1915	1,102,794	6,800	.62	1,099,394	
1916	1,100,563	- 2,231	- .20	1,101,678	
1917	1,097,672	- 2,891	- .26	1,099,117	
1918	1,108,373	10,701	.97	1,103,022	
1919	1,177,405	69,032	6.23	1,142,889	
1920	1,207,835	30,430	2.58	1,192,620	
1921	1,239,966	32,131	2.66	1,223,901	
1922	1,265,397	25,431	2.05	1,252,682	
1923	1,289,221	23,824	1.88	1,277,309	
1924	1,316,174	26,953	2.09	1,302,698	
1925	2/ 1,346,076	29,902	2.27	1,331,125	
1926	1,365,417	19,341	1.44	1,355,746	
1927	1,385,401	19,984	1.46	1,375,409	
1928	1,401,472	16,071	1.16	1,393,436	
1929	1,418,914	17,442	1.24	1,410,193	

New Zealand Official Year Book, 1925 and 1931. Last column is computed from Column 1.

1/ Estimate as of December 31.

2/ The estimate for this year just preceding the census is admittedly too high to show accurately the increases during this and the following year. Also half-caste Maoris living as Maoris were included with Europeans as they were not in the 1926 census.

Improvement of Resources and Technique

Dairymen of New Zealand are now devoting more and more attention to increasing production per cow and per acre. This was the tendency throughout the decade following the war period which so stimulated expansion of the dairy industry in that country, but it has been so accentuated during the more recent years as to make it of peculiar current interest.

Relative increases in acreage of pasture lands, number of milk cows carried, and yield per cow reflect this tendency. The total area of occupied land in New Zealand on January 31, 1930, according to latest available data was 43,569,000 acres. This area exceeded the 35,508,000 acres occupied 28 years earlier by 22 per cent but was actually less than the maximum area of 43,653,000 acres occupied during the expansion following the war period. Even as early as 1920, nearly the same area, 43,473,000 acres, had been occupied.

Of these occupied lands, the area in grass, native and sown, (classed as "grassland farmed") comprised 28,412,000 acres or 80 per cent in 1902 and 31,535,000 acres or 73 per cent in 1930. The actual increase in the officially estimated area of grassland farmed over the entire 28 years was not more than 11 per cent or about 0.4 per cent per year as the average for the entire period. There appears to have been little if any significant change in this rate of increase in total pasture land during recent years. Of pasture lands devoted to dairying alone, no official data are available to provide a definite measure of increase, although the artificially sown area referred to in another connection may be presumed to represent somewhat more nearly the situation as to dairy lands.

Increased dairy output in New Zealand during this 28-year period has been out of all proportion to the increased areas occupied and improved as pasture land. The present volume of dairy production is certainly fully six times as great as the output at the beginning of this period as over against the increase of one-fourth in the total area occupied and one-tenth in grassland farmed. 4/

The factors of outstanding importance in this increase in New Zealand dairy production are the greatly increased carrying capacity per acre of pasture and, over the entire period, an improvement at least equally marked in yield of butterfat per cow. Official estimates of such increased productivity indicate that the pasture land of the Dominion now carries 52 per cent more livestock (of comparable units) per acre than in 1901-02 and that butterfat yield per cow averages some 56 per cent heavier. 4/

Clearly, the growth of the New Zealand surplus of dairy products is not now limited to expansion of the area given over to dairying nor even to increase in the number of dairy cows. Average yield per cow has been a better index of total milk production and of exports of dairy products in very recent years than the total number of cows, and much of the increase in the dairy herd has been taken care of by means of improved grass growth and better management, generally, which have increased the carrying capacity of lands already occupied.

Marked improvement in average yield per cow for the entire Dominion during recent years shows the cumulative effect of the herd-testing movement initiated by the Government just before the war. In the following comparisons drawn from official estimates, expansion of the area devoted to grass for

4/ Based on data published in the New Zealand Official Yearbook, 1929, Special Article, pp. 990-1000, by E. J. Fawcett and W. N. Paton, Economists, New Zealand Department of Agriculture.

grazing purposes is clearly shown to have been checked along with a marked improvement of carrying capacity, particularly through increased use of fertilizer for top dressing of pastures, while increase in the number of dairy cows has been checked simultaneously with and probably as an effect of the spread of herd-testing and improvement in yield per cow.

The season of 1923-24 appears to have marked the turning point in these directions with sufficient definiteness to justify the use of this season as a base year upon which to construct indexes of the various factors determining the total output of dairy products. Allowing for variation in weather conditions as affecting output from year to year, the increase of nearly one-fourth in the total production of butterfat since 1923-24 is seen to have been remarkably steady despite the very slight increase in the dairy herd and some actual decline in pasture area. Statistics of total area under grass for grazing purposes do not, of course, provide an accurate index of pasture lands devoted to dairying alone, but reflect only the general tendency as to extension of grass lands farmed. The actual trend in area devoted to cattle-raising and dairying is probably more closely reflected in the acreage sown to grass. Even these artificially sown areas have been extended but slightly relative to increases in numbers of cows carried and yield per cow as shown in Tables 12 and 13.

Table 12.- Estimated acreage in grass, number of milk cows, and production of butterfat in New Zealand, 1918-19 to 1929-30

Season beginning Aug.	Acreage in grass		Milk cows, as of		Production of butterfat	
	Total	Sown for grazing	Jan. 31	Per cow	Total	
	1,000 acres	1,000 acres	Number	Pounds	1,000 pounds	
1918-19 . . .	31,457	15,832	826,135	150.64	124,449	
1919-20 . . .	31,017	16,125	893,454	152.04	135,841	
1920-21 . . .	30,906	15,913	1,004,666	154.25	154,970	
1921-22 . . .	30,722	16,113	1,137,055	174.97	198,951	
1922-23 . . .	30,998	16,259	1,248,643	180.62	225,530	
1923-24 . . .	31,252	16,448	1,312,588	174.10	228,522	
1924-25 . . .	30,922	16,451	1,323,432	182.09	240,984	
1925-26 . . .	30,915	16,616	1,303,856	179.40	233,912	
1926-27 . . .	30,878	16,680	1,303,225	198.50	258,690	
1927-28 . . .	30,963	16,872	1,352,398	195.33	264,232	
1928-29 . . .	30,987	16,856	1,371,063	206.00	282,439	
1929-30 . . .	31,535	16,873	1,440,321 ^{1/}	225.00	324,072	

Data from New Zealand Official Yearbook, 1929 and 1931.

^{1/} As reported editorially in summary review of the testing year in the New Zealand Dairy Produce Exporter, August 30, 1930.

Table 13.- Index numbers of acreage in grass, number of milk cows, and production of butterfat in New Zealand, 1918-19 to 1929-30

1923-24 = 100

Season beginning Aug	Acreage in grass			Milk cows	Production of butterfat	
	Total	Sown for grazing			Per cow	Total
1918-19	101	96	63	87	54	
1919-20	99	98	68	87	59	
1920-21	99	97	77	89	68	
1921-22	98	96	87	100	87	
1922-23	99	99	95	104	99	
1923-24	100	100	100	100	100	
1924-25	99	100	101	105	105	
1925-26	99	101	99	103	102	
1926-27	99	101	99	114	113	
1927-28	99	103	103	112	116	
1928-29	99	102	104	118	124	
1929-30	101	103	110	129	142	

Data from New Zealand Official Yearbook, 1929 and 1931.

1/ Based on unofficial figures as noted in Table 12

Of the factors at present affecting efficiency of dairying in New Zealand, carrying capacity or the acreage required per cow is calculated by New Zealand farm economists to have even greater weight than yield per cow. "The outstanding feature in the study of farm statistics was the importance of carrying the greatest number of cows compatible with safety. It was the farm which carried the highest number of animals to any given area which invariably had the high per acre yield. So important was this factor that it was noticeable on many farms of medium herd average that the per acre output was higher than on farms with an extremely high herd average but with a lesser number of cows per acre." 5/ The following summary (Table 14) of results of a field study by the Department of Agriculture affords a fairly adequate sample of farms of varying size on which this tendency was demonstrated. 5/.

5/ Report of February 8, 1929, from American Trade Commissioner, Julian B. Foster at Wellington, quoting results of field studies by the Department of Agriculture of New Zealand.

Table 14.-Cows carried per 100 acres and average yield of butterfat per cow and per acre on 206 farms, season 1926-27

Number of farms	Size of farms Acres	Cows carried per 100 acres Number	Butterfat produced	
			Per cow Pounds	Per acre Pounds
37	50-89	43	272	117
64	90-129	38	258	98
23	130-175	35	263	92
32	176-250	37	263	99

In much of New Zealand the configuration of the land is such as to make it unsuitable to any agrifutural use other than for permanent pasture. Wherever there is light and moisture, English grasses thrive when the original native bush and fern are cleared off, and accordingly, artificially sown grassland occupies by far the greatest portion of the cultivated area of the country. In the pioneer work of clearing and seeding such land, however, much of it is said to have been sown as cheaply as possible and its reseeding, later, was accomplished with difficulty.

Artificially sown pasture grasses are gaining steadily in area relative to the native grasses. As late as 1918-19 the areas were practically the same for these two types of pasture, the former comprising 15,831,604 acres and the latter 15,625,468 acres. By 1928-29 the artificially sown pastures had come to occupy 16,855,512 acres against 14,131,630 acres of native or natural grass. The persistent shift in this direction is indicated in Table 15.

Table 15.- Pasture grasses: Native and sown, 1918-19 to 1928-29

Year beginning Aug. at	Acres for grazing		
	Tussock and other: native grasses	Sown grasses	Total
	Acres	Acres	Acres
1918-19	15,625,468	15,831,604	31,457,072
1919-20	14,892,113	16,125,265	31,017,378
1920-21	14,995,446	15,912,803	30,906,249
1921-22	14,609,603	16,112,598	30,722,201
1922-23	14,739,382	16,258,651	30,998,033
1923-24	14,806,257	16,447,570	31,253,807
1924-25	14,470,990	16,450,625	30,921,615
1925-26	14,298,618	16,615,960	30,914,578
1926-27	14,197,853	16,680,348	30,878,201
1927-28	14,091,717	16,871,530	30,963,247
1928-29	14,131,630	16,855,512	30,987,142

New Zealand Official Yearbook, 1929 p. 464, and Statistical Report on the Agricultural and Pastoral Production of the Dominion of New Zealand for the season, 1928-29, p.9.

The improvement of such grassland by means of additional seeding, cultivation, and particularly by top-dressing is increasing greatly its carrying capacity as pasture. Fertilizer of great value for top-dressing of grassland became available to New Zealand after the war by the acquisition (jointly with the Imperial Government and Australia) of adjacent islands rich in guano deposits. The island of Nauru is estimated to have 100,000,000,000 tons of guano deposits from which some 600,000 tons are being taken yearly. 6/

6/ E. V. Wileox, travel notes obtained by interview.

Information regarding areas top-dressed, together with the kinds and quantities of fertilizer applied, was collected in New Zealand for the first time in 1926-27. The data cover the entire Dominion although the practice of top-dressing is as yet less prevalent in the South Island. The acreages as summarized for 1926-27 and 1927-28 are approximations only to the actual total area fertilized, owing to the fact that reports then covered each separate sowing, only, regardless of whether or not there was duplication, that is, the same areas sown with more than one kind of fertilizer. In 1928-29, the area reported as fertilized was 2,757,869 acres, while it is noted in the published statement for that year that after making allowance for areas on which two or more fertilizers were used, the actual area top-dressed was 2,385,182 acres. The short series of comparative figures are extremely significant, nevertheless, as summarized in Table 16.

Table 16.- Acreage top-dressed and quantity of fertilizers applied, New Zealand, 1926-27 to 1928-29

Season beginning Aug.	Acreage		Quantity of fertilizers used Pounds
	Total separate sowings	Actual area top-dressed	
	Acres	Acres	
1926-27	1,521,259	1/	490,896,224
1927-28	1,952,490	1/	647,726,912
1928-29	2,757,869	2,385,182	841,720,208
1929-30	3,214,320	2,650,748	960,444,688

New Zealand Official Yearbook, 1929 and 1931, and Statistical Report on the Agricultural and Pastoral Production of the Dominion of New Zealand for the season, 1928-29, p.10.

1/ Data not separately published.

In the North Island three-fourths of the quantity of all fertilizers used in 1929-30 was superphosphate, while in the South Island the use of lime predominated in nearly as large proportion.

In determining the present and future competitive position of New Zealand dairying such forms of intensification in the industry have come to be fully as significant as the original natural resources. Cheaper butterfat production is now becoming widely recognized in New Zealand as the first essential to further progress in dairying, and, as analyzed by their experts in farm management, this means increased production per acre of land. As means to this end, greater attention is being given to (1) herd improvement or increasing the producing capacity per cow and (2) adequate feeding involving improvement of grass and fodder crops. Herd improvement, involving cow-testing, culling and breeding is the slower process while proper feeding which lends itself to more immediate and rapid improvement is the direction in which greater profitableness of dairying is first being sought.

By way of demonstration of the comparative ease with which advancement in dairying may be obtained through better feeding, the New Zealand Dairyman of February 20, 1930, presents editorially some figures based on New Zealand conditions. Results of experiments are cited to show that a cow of 1,000 pounds weight required approximately 60 pounds of grass as its maintenance requirement per day, or 10 tons of grass or its feed equivalent per year. In addition to the cow's maintenance requirement, approximately 1 ton (2,240 pounds) of grass or equivalent food is required to produce each 30 pounds of butterfat. The following table is given to illustrate this relation between feed and production and to emphasize the significance of the maintenance requirement as the great drain in dairy feeding and the proportionately heavy drain thus sustained in feeding low-producing cows.

Although it is physically possible for cattle to be grazed the year around in most of New Zealand, maximum efficiency of dairy herds is not obtained without modification of the seasonal feed supply. The need of a more rational or stabilized distribution of the year's feed supply and the possibilities open to New Zealand dairy farmers in this direction are made apparent by an analysis published recently in the New Zealand Dairy Farmer. In this analysis the year is divided into the several rather distinct periods into which it naturally falls with regard to feed supply and requirements. For convenience these were classified roughly as (1) the spring and early summer period of large production of milk and excess production of grass feed extending from about the middle of August to the end of December, (2) the midsummer and autumn period of light production and normally insufficient pasture growth now seriously regarded as the critical feeding period when some supplementary green crops are needed, and (3) the winter feeding period from about the middle of May to the middle of August when most of the cows are dry. Normally, two-thirds of the milk yield is obtained during the first period. (Table 17)

Table 17.- Normal feed production, feed requirements, and milk yield by periods of the seasonal year in New Zealand

Period	: Pasture feed : Feed required.			: Milk	
	: produced, per-: percentage :			: yield,	
	: centage of : of : Balance			: percentage	
	: yearly : yearly :			: of annual	
	: production : requirements :			: yield	
	: Per cent : Per cent : Per cent			: Per cent	
Aug. 16-Dec. 31 ($4\frac{1}{2}$ mos.)	: 68	: 43	: + 20	: 67	
Jan. 1-May 15 ($4\frac{1}{2}$ mos.)	: 20	: 36	: - 16	: 33	
May 16-Aug. 15 (3 mos.)	: 12	: 16	: - 4	: -	
	: 100	: 100	: :	: 100	

Data from the New Zealand Dairy Farmer, February 20, 1930, pp.16 and 17.

Obviously, much more efficient production is possible through conversion of the surplus grass grown during the period August to December into ensilage for use together with forage crops during the December to May period, or into hay for feeding together with root crops chiefly during the winter months. Top-dressing and better grazing management provides additional feed during the spring and early summer, but in the absence of feed conservation from season to season either the farms must be stocked less heavily or the cows will be underfed

during certain periods of the year. Underfeeding during the latter part of the producing season and unsatisfactory maintenance during the winter following is doubly serious, in that it affects not only the output for the particular season but retards production in the following spring as well. It is recognized also by New Zealand leaders that grass gains in nutritional value by being grazed short enough and uniformly enough to keep the growth leafy and vigorous. The more complete utilization of farm labor under the system of conservation of surplus grass for ensilage and hay is a further factor of importance in the process of intensification. Table 18 as presented obviously makes no allowance for any possible diminishing returns in feeding up to the point of the full producing capacity of the cow and assumes a producing capacity of 450 pounds per cow. The object as stated is to illustrate the importance of feeding cows to the limit of their producing capacity on the assumption that, while the cow's maintenance requirement remains the same, the production requirement bears a direct relationship to yield of milk.

Table 18.-Relation between feed used and butterfat produced by a cow of 1,000 pounds weight. 1/

Annual food requirement			Yield of butterfat	
For maintenance	For production	Total	per season	
Tons	Tons	Tons	Pounds	
10	5	15	150	
10	6	16	180	
10	8	18	240	
10	10	20	300	
10	12	22	360	
10	15	25	450	

New Zealand Dairyman, February 20, 1930, article by Harold W. Hesse, Supervisor of Agricultural Instruction, Wellington Educational Board, "Feeding Cows for Milk Production"

1/ Based on tons of grass or its feed equivalent per year. The New Zealand ton is equal to 20 hundred weight of 112 pounds or 2,240 pounds.

Such emphasis upon the profitableness of feeding to full capacity of the herd carries with it as a corollary the warning against overstocking. Studies made by New Zealand officials showing that carrying capacity of the land is an even more important factor than yield per cow in determining yield per acre and profit to the dairymen applies only in the sense that all cows carried were provided feed to their full capacity and does not imply that numbers could be increased to outweigh underfeeding.

New Zealand dairy production, where grass is chiefly depended upon for feed-supply, is naturally highly seasonal. As the year progresses, a period of surplus feed is followed by a period of deficiency of feed. Through improved methods of conservation of feed supplies and better farm management, a given area of land could be made to support more cows and maintain them in a condition that would result in a heavier yield for the year than has followed in the past from the more extensive system. The potential developments in this direction are quite immeasurable and are being urgently advocated

as the necessary means of lowering the cost of production to meet modern international competition.

The extent to which fodder and root crops are being grown in recent years to supplement grass as the bulk of the feed supply is indicated in Table 19.

Table 19.- Supplementary fodder and root crops grown in New Zealand, 1918-19 to 1929-30

Year beginning:	Chaff, hay, or ensilage		Green fodder		Root crops	Total
Aug	Cereal crops	Grasses and clovers, including alfalfa	Cereal crops not harvested	Other crops	for feeding to stock	area of fodder crops
	Acres	Acres	Acres	Acres	Acres	Acres
1918-19	304,172	131,557	14,026	149,622	447,619	1,046,996
1919-20	325,599	117,110	15,620	166,758	553,174	1,178,261
1920-21	413,019	161,813	18,346	185,284	562,586	1,341,048
1921-22	347,135	187,363	18,818	201,351	520,877	1,275,544
1922-23	304,564	175,558	25,353	249,417	505,738	1,260,630
1923-24	329,829	188,979	30,042	259,652	491,052	1,279,554
1924-25	310,474	229,644	17,426	240,061	471,955	1,269,560
1925-26	246,810	224,777	20,412	255,429	484,441	1,231,869
1926-27	257,553	288,455	14,742	219,031	477,492	1,257,278
1927-28	203,838	280,241	14,669	216,702	472,101	1,187,551
1928-29	196,545	351,107	16,683	219,088	491,842	1,275,265
1929-30	192,660	412,538	26,240	203,438	486,969	1,321,895

New Zealand Official Yearbook, 1929 and 1931.

Herd-testing and its Far-reaching Effect upon New Zealand Dairying

Associations for the testing of groups of herds to determine butter-fat production have made remarkable progress since the first model herd-testing association was established by the New Zealand Department of Agriculture in 1910-11. The number of cows tested in all associations during the 1929-30 season is reported to have approximated 500,000 or nearly 20 per cent of the total number of cows milked. Herd-testing has become a "movement" in New Zealand and is increasingly recognized as the most effectual means of putting dairy farming on a business basis. It is claimed now that the more culling of cows already in the herds is a passing phase and that the better basis afforded by it for breeding for production and the stimulus to improved breeding, feeding, and management, generally, is resulting in a quiet revolution in dairy farming.

The substantial progress made during very recent years in the testing of herds in New Zealand to determine actual butterfat production of individual cows and herds is evidenced in most of the current literature of New Zealand dairy practices. The object of such testing, as repeatedly stated by responsible leaders in the movement, is to provide the basis not only for effective culling of the present milking herds, but for "calf-marking" as

one of the means of the most profitable expansion of the dairy industry for the future.

The steady progress that has been made in herd-testing, both as to numbers of cows under test and in average yield per cow is indicated in Table 20.

Table 20.- Number of herds and cows in New Zealand Cooperative Herd-testing Association and butterfat yield per cow

Season	Groups	Herds	Cows	Pounds of butterfat: (average)	Days
beginning					
Aug.				1/ Pounds	Number
	Number	Number	Number		
1922-23 <u>2/</u>	6	157	6,900	-	-
1923-24	25	630	31,003	207.81	237
1924-25	45	1,257	55,745	227.52	238
1925-26	49	1,335	56,010	232.02	244
1926-27	53	1,432	60,507	255.49	250
1927-28	60	1,570	72,734	<u>3/</u> 228.37	241
1928-29	67	1,712	80,826	<u>5/</u> 244.89	255
1929-30 <u>4/</u>		1,844	94,085	<u>3/</u> 262.00	

Annual reviews of the Chairman of the New Zealand Cooperative Herd-testing Association as published in the Dairy Farmer of Hamilton, New Zealand, issues of July 20, 1928 and 1929, except as otherwise stated.

1/ In New Zealand, milk is sold to the factories on the basis of its butterfat content, and the general usage is for producers to refer to yield per cow in terms of butterfat.

2/ In the 1922-23 season the work was carried out by the New Zealand Farmers' Union Herd-testing Association.

3/ Average based on all cows in the herd in milk 100 days or more. For previous years, averages are for "normal" cows only.

4/ Reported by American Consul Walter F. Boyle, Auckland, August 21, 1930.

In 1923-24, 3.65 per cent of the 630 herds under test by the New Zealand Cooperative Herd-testing Association produced an average of over 300 pounds of butterfat per cow. In 1928-29, 13.55 per cent of 1,712 herds produced over 300 pounds per cow. On the basis of the total number of cows under test, 11.6 per cent produced over 300 pounds in 1923-24 and 24.6 per cent in 1928-29. Cows producing less than 200 pounds accounted for 48 per cent and 30 per cent, respectively.

Economy in the Use of Labor

Intensive dairying is developing in New Zealand with proportionately less labor than is generally associated with it. Although land is now being economized through improvement of its carrying capacity and the maintenance of only the more efficient cows, labor is not cheap. Economic conditions in New Zealand, generally, make the economizing of labor one of the first essentials to success in profitable dairying. The standard of living is high. An Arbitration Court fixes wages in the industries that afford alternative employment to farm workers, awards being based more on the needs

of the workers and their families than on the value of their production. Although farm wages are not generally fixed by the Arbitration Board at this time, the effect tends to be the same since a fairly close relationship with industrial wages must be maintained on the farms in order to obtain labor.

It is evident that this situation has much to do with the prevalence of the milking machine in New Zealand to an extent not equalled in any other dairy country of the world. It is officially estimated that practically two-thirds of the cows milked in New Zealand are now milked by machinery. (Table 21) This practice is also encouraged by the availability of cheap hydroelectric power. The rural area thus served has recently been expanding and apparently the resources for water power are sufficient for electrification of the entire dairy industry. The number of milking machines in use in the Dominion has more than doubled during the last ten years as shown by the following official figures. In 1930 the number of cows milked by machinery averaged 47 cows for each milking plant.

Table 21.- Numbers of milking plants and cows milked by machinery, 1919-1929

Year	Milking plants	Cows milked by machinery (Jan. 31)	
		Total	Percentage of all dairy cows
	Number	Number	Per cent
1919	7,577		
1920	8,806		
1921	10,450		
1922	12,468	533,345	47
1923	13,553	611,287	49
1924	14,553	670,934	51
1925	15,561	705,033	53
1926	16,391	729,272	56
1927	17,090	753,751	58
1928	18,049	816,643	60
1929	18,756	874,971	64
1930	20,415	967,131	67

Data from New Zealand Official Yearbooks and Statistical Report on the Agricultural and Pastoral Production of the Dominion of New Zealand.

Utilization of By-products

Another form of intensification of the New Zealand dairy industry is now evident in the utilization of by-products which had previously been neglected in the concentration of effort upon the maximum production of milk for manufacture into butter and cheese. Quantity of milk has not been regarded as so important as quantity of butterfat, owing to the little attention given to skim-milk utilization and accordingly to milk yield as such. Payment has been made to producers even for cheese milk on a straight fat-content basis. Incidentally, this emphasis on butterfat production has tended

to promote cow-testing. The comparative absence of calf-rearing or pig-feeding has been compensated for in part by a casein industry of some importance to utilize the skim milk.

Many calves have been and still are considered to be a useless by-product of the dairy industry in New Zealand. Only a small percentage of the calves are required to replace the cows. Veal is commonly referred to as of the "despised calf" and is so abundant during certain seasons as to be considered "dog's meat". 7/ It is still common practice to discard some of the calves without attempting to prepare them for veal, but a better utilization of the calf crop is developing.

An American Consul, writing from Wellington as of April 24, 1928, says that not long ago the way was opened for the marketing of more calves by the development of a market for week-old veal in the United Kingdom. "A further outlet for the calves of nonpedigree cows and registered pedigree sires was provided a couple of years ago by the ear-marking of desirable animals and their registration as coming from cows having a production of 300 pounds butterfat. A reduction of 25 and 50 pounds is permitted for 3-year and 2-year heifers, respectively. The demand for the authoritatively marked animals was immediately well above the supply and the apparent market for the tattooed calf was an incentive for the farmer to have every cow tested in order to be able to sell her progeny advantageously". 8/

The possibility of developing a bacon industry in New Zealand has recently received more serious attention than formerly. Since 1919 the number of hogs reported has shown a steady increase up to January 31, 1929, when a slight decline was recorded. Most New Zealand dairy farms now carry some hogs but in contrast with Denmark where the number of milk cows is nearly the same, the total number of hogs is only about a fourth as great. Some indication of the potential development of a bacon industry in New Zealand as an important supplementary farm enterprise is afforded by the fact that under the system of intensive dairying now established in Denmark there are at least two hogs for each milk cow, while in New Zealand on January 31, 1930, there were about three times as many milk cows as there were hogs. And, whereas in Denmark the value of the bacon industry exceeds that of butterfat, in New Zealand hog production is only about one-fifteenth as great in its value to producers as butterfat production. The heavy cheese production in New Zealand as compared with Denmark is, of course, an important factor affecting a bacon industry in the two countries to the disadvantage of New Zealand.

7/ See editorial in New Zealand Dairyman, May 20, 1926.

8/ American Consul in Charge, Bernard Gotlieb, who says also: "The beginning operations of both the 'bobby veal' trade and the tattooed calf systems have now been absorbed by the Dominion Federation of Herd Testing Associations and other national organizations and the advantages are available to the whole dairying industry".

Exports of dairy and pork products from the two countries show a still greater disparity. Exports of pork products in 1930 represented a value 20 per cent in excess of the dairy products in Danish export trade, while New Zealand exports of pork products in that year represented only 3 per cent of the value of dairy products exported.

The comparatively slight but increasing importance of pork production for New Zealand's export trade is indicated by the percentages of the pork, bacon, and ham produced which has gone into domestic consumption in recent years. During the 10-year period ended March 31, 1924, 99 per cent of all New Zealand pork products went into domestic consumption, whereas during the five years, 1924-1928, 82 per cent was consumed within the Dominion. 9/ During the latter period exports of pork, frozen, salted, and cured reached an average of 9,514,000 pounds annually.

Generally insufficient supplementary feeding of pigs with hardening grain feeds has been a drawback to the development of an export trade in bacon, according to New Zealand writers. However, recent investigations in England as to the quality of New Zealand bacon in comparison with bacon from competing countries have been extremely encouraging, according to the March 20, 1930, issue of the Dairy Farmer of Hamilton, New Zealand. "It conclusively proves that if we do things well and plan our work properly so that two litters in the year can be got away, there is a big future in the pig business, making it a source of income that will help materially to supplement our declining profits from butterfat."

Marketing Organization

Since dairy production in New Zealand is so dependent upon grass growth as to result naturally in a highly seasonal output, and since this normal seasonal fluctuation is just the reverse of that of the competing dairy regions of Europe and North America, the competitive marketing advantage thus afforded New Zealand dairy interests has not been conducive to stabilization through artificial modification of the seasonal trend of production so much as through control of shipment of the produce to market. Even in such control of shipping, one of the chief considerations is the encouragement thus offered dealers and consumers through a more nearly continuous availability of supplies of the New Zealand product in the markets of Great Britain. The aim of New Zealand producers since the earliest attempts at control has been to establish thereby a steady and sustained demand for their product by spreading the supplies more evenly throughout the year, with a view, of course, to obtaining thereby the most profitable sale of the entire output.

The normal seasonal trend of New Zealand dairy production together with one of the early proposals for regulation of shipments is shown in Table 22 as published officially by the New Zealand Dairy Produce Export Control Board in its first annual report.

9/ New Zealand Official Year Book, 1930.

Table 22.- Production and proposed regulation of shipments of butter and cheese in New Zealand

BUTTER					
Seasonal production					
Month	Average	Percentage to be shipped	Percentage to be withheld or added to shipments 1/	Percentage to be accumulated end of month 1/ 2/	
	Per cent	Per cent	Per cent	Per cent	
Aug....	3.02	$\frac{3}{4}$			
Sept....	8.17	$\frac{3}{4}$			
Oct....	12.79	$\frac{3}{4}$			
Nov....	14.18	$\frac{3}{4}$			
Dec....	14.30	9	Withheld 5		5
Jan....	13.56	9	" 5		10
Feb....	11.12	9	" 2		12
Mar....	10.43	9	" 1		13
Apr....	6.57	$8\frac{1}{2}$	Added 1		12
May....	3.86	6	" 2		10
June....	1.10	$5\frac{1}{2}$	" 3		7
July....	.76	$5\frac{1}{2}$	" $4\frac{1}{2}$		$2\frac{1}{2}$

CHEESE

Aug....	.40	$\frac{3}{4}$			
Sept....	4.01	$\frac{3}{4}$			
Oct....	10.16	$\frac{3}{4}$			
Nov....	15.08	$\frac{3}{4}$			
Dec....	15.67	10	Withheld 5		5
Jan....	14.86	10	" 5		10
Feb....	11.41	10	" $1\frac{1}{2}$ to 2		$11\frac{1}{2}$ to 12
Mar....	10.09	10	" $1\frac{1}{2}$ to 2		13 to 14
Apr....	8.43	10			
May....	7.41	7			
June....	2.17	7	Added 5		8 to 9
July....	.18	7	" 6 to $6\frac{1}{2}$		2 to $2\frac{1}{2}$

New Zealand Dairy Produce Exporter, August 29, 1923.

1/ Approximate figures.

2/ Calculation not included in official source.

3/ All butter and cheese to be shipped as promptly and regularly as possible.

Attention is called by the Board to the fact as shown by these figures that during the six months, October to March, inclusive, there is produced on an average fully three-fourths of the season's output of butter and cheese. The figures published show 76 per cent of the butter and 77 per cent of the cheese as produced within the half year. The length of the season for manufacture of butter and cheese is around 44-45 weeks.

With such a highly seasonal production, the practice of contracting for the season's output came to be established by London buyers at prices sufficiently low to allow for the market risk involved. Great instability resulted, however, and such heavy losses were sustained even by interests strong enough to control their own distribution that stabilization through some form of general control was sought. Storage facilities available on a large scale in New Zealand together with improved transportation services made possible the regulation of shipments, and large quantities of produce were already being withheld from the speculative contract market and sold by producing companies in accordance with developments in the open market. Other farm products including meat and fruit had been marketed to advantage under control and only a period of particularly unsatisfactory returns to dairymen was necessary to turn the attention of dairy interests throughout the country to the expediency of attempting a similar control over the exportation of butter and cheese. Legislation was sought and secured in 1923, permitting the export control of dairy products, and the act was approved, through a referendum vote, by a majority of the dairy producers of the Dominion.

Under the Dairy Produce Export Control Act of 1923, a Board was set up whose duties were to control the shipment and sale of butter and cheese in the interest of New Zealand producers, funds for its administration to be derived from nominal levies on all butter and cheese exported. The Control Board set up by the act consists of two Government nominees, nine representatives of suppliers to dairy factories, and one person who represents manufacturers of dairy produce. The Board, under the original act, was given power to exercise either limited or absolute control over exportation. At the time this legislation was enacted, fully 90 per cent of the dairy factories were already owned, financed, and controlled by the farmers themselves, but no centralized control over marketing existed.

This marketing organization, aimed at economy and stabilization in the dairy industry of New Zealand, has assumed various forms during recent years ranging from absolute Government control to private initiative on the part of powerful groups of cooperatives. Even under the latter form of private initiative the objective is clearly that of linking the whole of the industry into a national cooperative marketing organization. The definitely avowed aim is to build eventually upon the New Zealand organization a cooperative structure which will eliminate competition from all parts of the British Empire.

The functions of the Export Control Board have been much modified since its formation, until, after a brief and unsuccessful experiment in absolute control involving price-fixing during a critical period in 1926-27, and the subsequent rescinding of the absolute-control provision, they have become so seriously weakened as to give rise to vigorously renewed effort to bring about voluntary cooperative organization with a still wider scope.

The Dairy Council, the first meeting of which was held in Wellington, on December 5, 1929, is the most tangible result to date of the prolonged effort that has been directed toward superseding the Government Control Board

by a voluntary organization for the marketing of all New Zealand dairy produce on a cooperative basis.

Prior to the organization of the Dairy Council, the dominant factor in the field of marketing of New Zealand butter and cheese was the New Zealand Cooperative Dairy Company and the cooperative marketing agency, Amalgamated Dairies, initiated by this company. The Dairy Council is to have a membership comprising the chairman of directors of each of the cooperative dairy companies selling their produce through Amalgamated Dairies. As the final objective is to induce all cooperative companies to sell through this one consolidated cooperative marketing organization, the Dairy Council is expected eventually to be fully representative of the dairy industry of New Zealand with benefits distributed among the contributing companies. The final stages of the marketing of dairy produce are to be transacted by agents of Amalgamated Dairies or by Empire Dairies, the central selling agency or consignment house in Great Britain. Amalgamated Dairies will be New Zealand's representative of Empire Dairies and will do no selling except through its agents who will not compete in prices with Empire Dairies. By means of this centralized selling agency for New Zealand and possibly also for the other Dominions eventually, producers are planning to be in a position to deal more effectually with the already centralized buyers.

The New Zealand Surplus as Affecting the United States

Exports of dairy products from New Zealand may at any time affect United States markets either directly or indirectly, or both. The most direct and obvious competition arises when butter from New Zealand reaches our markets. (See Tables 23 and 24) This takes place normally during our winter and early spring months which are summer and fall months in New Zealand. During this period the margin of prices as between finest New Zealand selling in London and closely comparable grades of domestic butter selling in New York is normally widest and domestic supplies of such high grade are lightest.

Table 23.- Butter: Average price per pound at New York and at London, with margins in favor of New York, by months, 1923-24 to 1930-31

	1923-24			1924-25			1925-26			1926-27		
Month:	New York	London	Margin	New York	London	Margin	New York	London	Margin	New York	London	Margin
92-	Fin-	in	score	92-	Fin-	in	92-	Fin-	in	92-	Fin-	in
:	est	favor	of	est	favor	of	est	favor	of	est	favor	of
:	Zea-	New	land	Zea-	New	land	Zea-	New	land	Zea-	New	land
:	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
July..	39.4	32.8	6.6	40.0	36.8	3.2	42.9	41.4	1.5	40.5	37.0	3.5
Aug..	44.1	37.2	6.9	38.4	40.2	- 1.8	43.4	42.5	.9	41.8	37.6	4.2
Sept..	46.0	40.2	5.8	37.9	41.8	- 3.9	48.2	44.8	3.4	44.6	35.1	9.5
Oct..	47.7	41.3	6.4	38.7	44.9	- 6.2	50.9	48.0	2.9	46.9	32.1	14.8
Nov..	52.6	41.1	11.5	42.9	43.5	- .6	50.7	44.8	5.9	50.6	31.8	18.8
Dec..	54.7	43.6	11.1	44.8	42.7	2.1	49.2	38.0	11.2	54.6	36.3	18.3
Jan..	53.0	40.2	12.8	39.9	35.6	4.3	44.9	37.7	7.2	49.2	37.3	11.9
Feb..	50.5	39.0	11.5	40.8	36.4	4.4	44.9	37.9	7.0	51.5	37.3	14.2
Mar..	46.7	32.9	13.8	47.5	37.5	10.0	42.8	37.4	5.4	50.2	34.0	16.2
Apr..	38.5	30.3	8.2	44.5	35.4	9.1	39.4	37.6	1.8	50.3	33.2	17.1
May..	38.5	32.8	6.1	42.6	36.4	6.2	40.8	37.8	3.0	43.5	35.0	8.5
June..	41.5	34.1	7.4	42.5	39.1	3.4	41.2	37.9	3.3	42.5	35.5	7.0
	1927-28			1928-29			1929-30			1930-31		
July..	42.0	34.7	7.3	44.9	40.2	4.7	42.4	37.2	5.2	35.2	29.6	5.6
Aug..	41.9	37.0	4.9	46.9	39.8	7.1	43.4	37.4	6.0	38.9	29.0	9.9
Sept..	46.5	38.9	7.6	48.8	39.8	9.0	46.2	38.6	7.6	39.8	27.6	12.2
Oct..	48.4	38.5	9.9	47.8	39.2	8.6	45.6	39.3	6.3	40.0	25.3	14.7
Nov..	49.8	37.8	12.0	50.6	38.3	12.3	42.7	37.5	5.2	36.1	22.4	13.7
Dec..	51.9	35.6	16.3	50.5	39.5	11.0	41.1	35.2	5.9	32.2	24.5	7.7
Jan..	48.8	33.9	14.9	47.9	40.1	7.8	36.6	33.8	2.8	28.5	25.1	3.4
Feb..	46.5	35.6	11.0	49.9	37.6	12.3	35.7	32.7	3.0	28.4	26.1	2.3
Mar..	49.4	37.6	11.8	48.4	36.3	12.1	37.3	30.0	7.3	28.9	25.6	3.3
Apr..	45.5	36.7	8.8	45.4	35.8	9.6	38.5	27.4	11.1	26.1		
May..	44.9	36.2	8.7	43.5	36.1	7.4	34.3	28.0	6.8			
June..	44.1	37.5	6.6	43.5	36.8	6.7	32.9	28.8	4.1			

Domestic prices are average of daily quotations as reported to the Bureau of Agricultural Economics.

London prices are average of weekly quotations as published in The Grocer and Oil Trade Review, London. Conversions at par of exchange since January, 1926.

Not only is the best grade of New Zealand butter closely comparable in quality with our highest grades and competitive with them, but the proportion of high-grade butter to the total output in New Zealand is unusually large.

Competition in the world markets has the effect in New Zealand, as in other countries dependent largely upon these markets, of stimulating much greater attention to quality of the product, at least that portion of it which is exported. In this direction New Zealand has already gone so far that authorities in the country now believe that little is still to be accomplished in this direction by comparison with the cheapening of production.

A rigid system of Government grading and inspection has long maintained the quality of the New Zealand export product. Butter containing less than 80 per cent of butterfat or more than 16 per cent of water may not be exported. Butter is graded at the cold-storage warehouses in New Zealand by officials of the Department of Agriculture on the following basis, according to information forwarded by American Vice Consul, Wm. P. Cochran, Jr., Wellington, New Zealand, on May 20, 1930.

<u>Points</u>	<u>Grades</u>
Flavor 50	Finest 93 points and over
Body and texture 25	First grade . . . 90 to 93 points
Color and salting (if any) . . . 20	Second grade . . . 88 to 90 points
Finish 5	
100	

"There is no requirement that third grade butter (below 88 points) may not be exported, but in practice the London buyers place such a low price on it that it is neither made nor shipped. Any well-organized and properly equipped factory can, with care, produce first grade butter consistently."

The national "Fern-leaf" brand is placed on every box forwarded for export which grades 90 points or over.

Percentages of the various grades of butter graded during several recent seasons are reported as follows by the New Zealand Export Control Board:

Year beginning Aug. 1	Butter graded					Average for season
	Quantity	Finest	First	Under first		
	Boxes	Per cent	Per cent	Per cent		Per cent
1927-28	2,922,629	69.77	27.72	2.50		91.34
1928-29	3,214,303	70.24	22.47	2.28		92.77
1929-30	3,767,157	76.30	22.33	1.37		-

Consumer preferences have to be considered, of course, along with the actual score or quality of the New Zealand product. English consumers customarily show a preference, for instance, as indicated by prices paid, for the comparatively fresh butter of Denmark, Irish Free State, and the Baltic States compared with "colonial," that is, New Zealand and Australian. Actual

gradings of the various butters do not account fully for the differences in price that ordinarily prevail.

In price, Colonial, especially Australian, falls generally below European butters with the exception of Siberian. Distance from the market is recognized as a factor of chief importance in giving rise to this disparity between the original quality of the various butters, on the one hand, and the prices paid by consumers in Great Britain on the other. The preference of English consumers for the near-by butter is attributed to the full lactic flavor which they desire and are willing to pay for, as well as to the conservatism which stands in the way of change from the comparatively long-established use of the fresh product from European sources.

Investigation and action in the matter of further popularizing the New Zealand product is one of the functions of the New Zealand Dairy Produce Export Control Board.

In October, 1930, a report was published by the Empire Marketing Board in London covering investigations extending over the greater part of the year, 1929. The following quotations are drawn from this report. 10/

"The object of the inquiry was to examine the position of Empire butters in the retail shops of the main centres of population in the United Kingdom and to estimate the extent and nature of the competition from butters of foreign origin."

"Butter is imported into the United Kingdom through three main channels: Australian and New Zealand butters, chiefly through London; Irish butter, through the ports on the West coast; and European butters, mostly from Denmark, through the ports on the East coast. The main markets for each type of butter tend to be grouped round the ports of entry."

"Evidence of local preference is shown by the relative prices of different butters. In the North and Northeast, where Danish butter predominated, it was sold on an average at 1 d or 2 d (approximately 2 to 4 cents) more than any other type; in the South, where it was comparatively rare, it was about the same price as New Zealand and Irish, and in the West it was only slightly dearer on the average than these types."

New Zealand butter "was found most frequently in shops doing a high or middle-class trade." In London, New Zealand butter sells higher under normal conditions of supply and demand than Danish.

10/ "The Demand for Empire Butter, Report of an Investigation by the Economic Section of the Empire Marketing Board into the Retail Marketing of Butter in the United Kingdom," October, 1930.

The peak of importation of New Zealand butter into the United States to date was reached in 1923-24 when 5,048,000 pounds were received, paying an import duty of 8 cents per pound. While the actual volume has been diminishing under increasing tariff rates, the proportion of New Zealand butter to our total butter importation has been increasing notably in recent years. As shown in Table 24, New Zealand butter since the 12-cent tariff went into effect in 1926 has comprised about one-half of our total butter imports.

Table 24.- Butter: Imports into the United States, average 1909-10 to 1913-14, annual 1919-20 to 1929-30, and tariff rates per pound in effect during the period

Year beginning July 1 :	Total :	From New Zealand :	Percentage of total from New Zealand :	United States tariff rates on butter with dates of change :
	: 1,000 pounds :	: 1,000 pounds :	Per cent :	Cents : Date effective
Average :	:	:	:	:
1909-10 to:	:	:	:	:
1913-14 :	2,480 :	249 :	10.0 :	2.5 : Oct. 4, 1913
1919-20 :	20,771 :	1 :	- :	do : -
1920-21 :	34,344 :	1,327 :	3.9 :	6.0 : May 28, 1921
1921-22 :	9,551 :	845 :	8.8 :	do : -
1922-23 :	15,772 :	3,887 :	24.6 :	8.0 : Sept. 22, 1922
1923-24 :	29,466 :	5,048 :	17.1 :	do : -
1924-25 :	7,189 :	1,935 :	27.6 :	do : -
1925-26 :	6,440 :	2,232 :	34.7 :	12.0 : Apr. 1, 1926
1926-27 :	10,710 :	3,682 :	34.4 :	do : -
1927-28 :	4,955 :	2,396 :	48.4 :	do : -
1928-29 :	3,299 :	1,674 :	50.7 :	do : -
1929-30 :	2,851 :	1,141 :	40.0 :	14.0 : June 18, 1930

The volume and distribution of butter exports from New Zealand are shown for the last pre-war years in Table 25, together with those of recent years during which a significant shift to North American markets has taken place. Temporarily a trade of some importance developed with Australia. Exportation of butter to Australia was stimulated when, through the adoption of the Paterson Plan in that country, Australian prices were artificially raised to practical parity with London prices on Australian butter. This exportation reached its greatest volume and its culmination in 1928 when the Australian tariff on New Zealand butter was raised from 2 pence or about 4 cents per pound, the prevailing rate under a reciprocal tariff arrangement between the two Dominions, to 6 pence or 12 cents per pound, effective June 15, 1928.

Table 25.- Exports of butter from New Zealand by countries, average
1909-1915 annual 1925-1929

Country to which exported	Calendar year					
	Average	1925	1926	1927	1928	1929
	1909-1915					
	1,000	1,000	1,000	1,000	1,000	1,000
	pounds	pounds	pounds	pounds	pounds	pounds
United Kingdom	54,399	132,940	118,975	132,130	129,722	143,006
Canada	2,421	338	5,293	13,004	22,367	37,554
United States	505	2,154	2,571	3,316	4,784	1,065
Union of South Africa	1,077	0	0	92	264	214
Australia	68	33	3,914	10,636	2,848	1/
Hawaii	0	1,279	1,031	1,175	1,158	1,226
Islands of Southern Pacific 2/	290	170	130	133	130	164
Dutch East Indies	0	93	138	246	120	120
Japan	0	38	211	319	195	247
Philippine Islands	0	73	185	132	48	259
Other islands and countries	1	2,503	372	837	866	1,391
Total	38,761	139,476	130,820	163,020	162,352	185,226
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Exports to United Kingdom as percent- age of total	89	95	91	82	80	77
Exports to North America as percent- age of total	8	2	4	10	17	21

Compiled from Trade and shipping of the Dominion of New Zealand.

1/ Less than 500.

2/ Includes New Caledonia, Fiji, Navigators Islands, Friendly Islands, Sandwich Islands, and Society Islands.

That no such shifts have taken place in the destination of New Zealand cheese exports is evident from the following summary, Table 26, which shows practically all of the cheese surplus as going still to the British or "home" market.

Table 26.- Exports of cheese from New Zealand by countries, average
1909-1913, annual 1925-1929

Country to which exported	Calendar year					
	Average	1925	1926	1927	1928	1929
	: 1909-1913:					
	: 1,000	: 1,000	: 1,000	: 1,000	: 1,000	: 1,000
	: pounds	: pounds	: pounds	: pounds	: pounds	: pounds
United Kingdom	55,213	153,662	162,471	165,633	175,771	198,257
Union of South Africa:	234	0	0	0	1	0
Australia	80	83	1,070	1,313	794	88
Canada	1/-	84	0	133	272	364
United States	1/-	333	119	1	614	427
Other countries	34	34	53	113	82	122
Total	55,561	154,196	163,693	167,193	175,534	199,258
	Per cent:	Per cent:	Per cent:	Per cent:	Per cent:	Per cent:
Exports to United						
Kingdom as percent-						
age of total	99.4	99.7	99.3	99.1	99.0	99.5

Compiled from Statistical Report on Trade and Shipping in the Dominion of New Zealand.

1/ Less than 500.

New Zealand cheese, although of the same Cheddar type as the bulk of the cheese produced in the United States, competes with our domestic product only indirectly. Exports of cheese from New Zealand to the United States are negligible as is shown in Table 26. On the other hand, exports to this country of cheese from Canada, where the Cheddar type is also principally produced, have in certain recent years been very considerable and must be regarded in part, at least, as a form of indirect competition from New Zealand cheese in the British markets.

Cheddar cheese supplies for the markets of Great Britain are drawn almost entirely from New Zealand and Canada and, accordingly, any oversupply in the British markets would tend to be met, if possible, by exporters in one or the other of these countries seeking an alternative outlet. It is apparent that New Zealand dairy interests have persisted in selling practically their entire surplus year after year in the British market whereas Canadian interests have been able during several recent years to divert varying quantities to United States markets to their advantage. Comparative prices of New Zealand and Canadian cheese in London, on the one hand, and American cheese in Plymouth, on the other, as shown in Table 27, reflect the depression that occurred in the British markets growing out of the general strike in the summer of 1926. The same table shows that imports of cheese from Canada into the United States jumped from 164,000 pounds in 1925-26 to 16,609,000 pounds in 1926-27. Our imports of Canadian cheese reached their peak to date in that year, but substantial shipments of Canada's best grades of cheese have been diverted to this country each year

since, while the British market has been correspondingly relieved to the advantage of the New Zealand producers.

Thus, although New Zealand cheese producers do not compete directly with producers in the United States by selling in our markets, there is always potential indirect competition, and in recent years this has materialized into considerable imports from Canada, whose producers must otherwise have sold in competition with New Zealand in the British market.

Table 27 - Cheese: Average price per pound in Plymouth, Wisconsin, and in London, and imports from Canada into the United States, 1921-22 to 1929-30

Year	Plymouth, Wis.:	London		Imports of cheese from Canada
beginning	Twins	Canadian:	New Zealand:	into United States
	Cents	Cents	Cents	1,000 pounds
1921-22	17.5	19.7	18.7	4,824
1922-23	21.7	23.6	23.3	5,858
1923-24	20.4	21.3	20.6	1,803
1924-25	19.6	21.2	20.7	483
1925-26	20.4	24.7	23.7	164
1926-27	21.4	21.0	19.6	16,609
1927-28	22.8	23.7	21.8	11,439
1928-29	21.2	24.8	22.5	9,381
1929-30	18.6	22.3	19.9	5,895

Data from Bureau of Agricultural Economics, Ministry of Agriculture and Fisheries of Great Britain, and United States Department of Commerce.

Prices of New Zealand and Canadian cheese in the London market, as compared over a period of years in Table 27, reflect the advantage gained recently by the latter in quality and price. The history of the development of the dairy industry in New Zealand would indicate that reversion to lower quality of product may not be permanent, but it is true that a falling-off in the quality of their cheese has recently called forth wide comment among New Zealand dairy interests. Over the same period the quality of their butter has been fully maintained at a high level.

That the quality of the cheese is not being maintained as well as that of butter is indicated in the sixth annual report of the New Zealand Dairy Produce Control Board covering the year ended July 31, 1930, in comparison with corresponding percentages as published for the two preceding seasons in the Board's fifth report. According to these reports, butter and cheese graded during these seasons were graded as follows:

Grade	Butter			Cheese		
	1927-28	1928-29	1929-30	1927-28	1928-29	1929-30
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Finest . . .	69.77	70.24	76.30	50.55	23.31	23.61
First	27.72	27.47	22.35	66.96	68.86	74.46
Under first .	2.50	2.28	1.37	2.48	1.82	1.93

This deterioration in quality of New Zealand cheese which is probably temporary appears to have grown out of an attempt at "standardization" of cheese, that is, bringing the butterfat content to a certain uniformity or standard instead of using milk as it comes to the factory in the manufacture of a full-cream cheese. It is pointed out that such standardization should not necessarily result in any lowering of quality as in skim-milk or filled cheese, but that the change aiming at a standard or uniform fat-content has in actual practice worked out to disadvantage rather than advantage in quality production. Current press comment by New Zealand officials would indicate that there has been some improvement in the quality of cheese since the slump of the past season.

Regarding this experiment in standardization of New Zealand cheese, the following quotation from an editorial in the Grocer and Oil Trade Review of London in its issue of July 5, 1930, is referred to by the New Zealand Dairyman of September 20, 1930, as of special significance as "the voice of the trade." "Traders assert that the inferior quality has already reflected itself in the market price to be obtained, when compared with the price of its competitor, Canadian full cream cheese, and unless New Zealand cheese improves, the gap may be so widened as to make New Zealand cheese rank as an altogether secondary article. In view of the decline in the quantity of Canadian cheese imported into the United Kingdom during recent years there would seem to be a better opening than ever for an imported cheese of the highest class. We would therefore urge New Zealand dairy farmers to take advantage of the opportunity which now presents itself and, by improving the quality of their produce, to gain the higher price. It is not too much to say that the trade in England would welcome the abandonment of 'standardised' cheese and a return to nothing but the 'full cream' variety."

As to the comparative importance of butter and cheese exports and the degree to which these two products provide alternative outlets for the New Zealand milk surplus, the prevalence of dual plants, that is, factories equipped for making either butter or cheese or both, is probably, on the whole, overemphasized. In quantity, that is by weight, butter exports have come recently to equal or even exceed the exports of cheese, which would make the value of butter exports now fully twice as great as that of the exports of cheese. Within the year, some stabilization is sought by diversion of milk from one to the other of these staple products. Such a policy usually involves the predominance of butter-making over cheese making in the earlier part of the season to be followed by relatively heavy production of cheese when the markets of Great Britain have begun to reflect adequate supplies of butter and seasonal falling off in receipts of Canadian cheese. In the stabilization thus obtained, the role of the dual factory is doubtless important, although in actual number these now comprise only about 12 per cent of the total. In addition to any control of production thus obtained, stabilization of price for the entire New Zealand surplus of butter and cheese is sought further through control of shipment as shown in tabular form in the preceding discussion of marketing organization.

Although the dairy industry of the United States has had to meet competition from New Zealand dairy products directly in the form of imports of New Zealand butter, and indirectly through exports of cheese from New Zealand to Great Britain, affecting our importation of cheese particularly from Canada, the marketing of the New Zealand surplus of butter has affected indirectly also the volume of our imports of fresh milk and cream.

Exports of fresh cream and milk from Canada to the United States were encouraged by our low tariffs on these products relative to the rates then in effect on the same quantities of butterfat in the form of butter. In competition with New Zealand butter producers selling in Canada and paying an import duty of 1 cent a pound, the dairy interests of southeastern Canada were finding it more profitable to market their cream in New England than to make butter for either their domestic or export market.

Tables 28 and 29 show the actual volume of such exportation of cream and milk from Canada to the United States seasonally, and for the Canadian fiscal years during the period of its recent phenomenal rise and still more recent decline, and the imports into Canada of butter from New Zealand. The latter have in all probability just passed their highest point for an indefinite time to come, at least until the very recently adopted change in the Canadian tariff policy is abandoned. Exportation of fresh cream and milk from Canada to northeastern United States has been increased to a volume which it could not have attained had it not been for a nearly proportionate increase in importation into Canada of New Zealand butter. From a net export of 24 million pounds of butter in 1924-25, Canadian trade had swung by 1928-29 to a net import of an equal quantity, almost wholly from New Zealand, with a further increase in 1929-30 to 40 million pounds. In this trade, New Zealanders enjoyed an extremely favorable tariff rate on butter under a reciprocal trade treaty. The import duty on New Zealand butter entering Canada was 1 cent per pound under a reciprocal trade agreement between the two Dominions in effect since 1925 until on October 12, 1930, that rate was raised to 4 cents and more recently still to 8 cents, according to latest information. As stated editorially in the New Zealand Dairy Produce Exporter of October 25, 1930, "When America barred Canadian dairy produce from entry, she forced Canada to bolt the door against New Zealand butter. This deprived us of an outlet for 20,000 tons of our dairy produce."

Table 28.- Cream and milk: Imports from Canada into the United States, by months, April, 1927 to January, 1931

Month	1927-28		1928-29		1929-30		1930-31	
	Cream	Milk	Cream	Milk	Cream	Milk	Cream	Milk
	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons
Apr.	77,704:	34,798:	295,145:	441,415:	186,222:	234,751:	129,727:	227,483
May	435,936:	342,294:	456,178:	583,082:	286,019:	381,594:	225,785:	164,370
June	724,759:	445,697:	439,636:	565,130:	1/483,078:	1/636,134:	2/232,020:	2/309,318
July	744,739:	462,793:	452,714:	648,837:	460,585:	598,846:	126,922:	171,507
Aug.	764,848:	417,746:	368,866:	400,457:	361,557:	402,713:	171,103:	174,020
Sept.	545,218:	523,806:	391,156:	620,139:	366,164:	536,175:	214,823:	170,539
Oct.	474,188:	595,198:	368,622:	663,011:	261,605:	241,461:	158,925:	60,157
Nov.	327,211:	501,019:	132,007:	317,556:	140,661:	212,648:	15,530:	116,350
Dec.	247,016:	343,260:	119,599:	362,150:	105,615:	250,597:	49,466:	71,091
Jan.	177,739:	340,032:	101,396:	363,275:	52,053:	160,473:	17,667:	63,462
Feb.	139,740:	234,989:	79,662:	161,016:	51,456:	123,462:	4,403:	53,171
Mar.	202,418:	439,729:	112,465:	205,721:	75,941:	86,537:	5,050:	56,623
Total	4,861,497:	4,641,405:	3,337,479:	5,365,739:	2,850,026:	3,367,131:		

Data from files of Bureau of Foreign and Domestic Commerce, United States Department of Commerce.

1/ Tariff increased, effective June 13, 1929, from 20 cents to 30 cents per United States gallon on cream and from 2.5 cents to 3.75 cents per gallon on milk.

2/ Tariff increased, effective June 13, 1930, to 56.6 cents per gallon on cream and 6.5 cents per gallon on milk.

Table 29.- Canada: Exports of cream and milk to the United States
and imports of butter from New Zealand, 1912-13 and 1919-20
to 1929-30

Year beginning April 1	Exports to the United States			Imports of butter from New Zealand
	Cream	Milk	Butter equivalent <u>1/</u>	
	Imperial gallons	Imperial gallons	1,000 pounds	1,000 pounds
1912-13	820,360	7,939	4,739	6,017
1919-20	795,780	1,985,113	5,566	149
1920-21	1,279,195	1,508,618	8,123	1,533
1921-22	1,671,678	1,391,299	10,330	2,269
1922-23	1,712,241	856,039	10,302	1,893
1923-24	2,783,866	2,191,395	17,142	1,297
1924-25	3,384,186	3,088,212	21,046	163
1925-26	4,120,181	4,598,199	26,035	2,343
1926-27	4,496,528	4,886,445	29,348	4,905
1927-28	4,017,796	3,624,794	24,966	13,624
1928-29	2,833,640	3,753,871	18,195	24,731
1929-30	2,293,270	3,099,754	14,756	39,745

Trade figures from Reports of the Trade of Canada.

1/ Calculated on the basis of 10.3 pounds of milk and 10.1 pounds of cream to the imperial gallon; cream containing 42 per cent butterfat or 12 times that of milk averaging 5.5 per cent butterfat; and 21 pounds of milk as required to produce 1 pound of butter.

Imports of New Zealand butter into the United States have been declining steadily since 1926-27 and during very recent months have been quite negligible. Canadian importers, on the other hand, had been increasing their purchases from New Zealand up to 40,000,000 pounds in the year ended March 31, 1930.

Marked decline in the sale of Canadian cream and milk in the United States has followed recent tariff increases on those products in the United States and the still more recent increases in the Canadian tariff on butter from New Zealand.

Statistical Summary

Table 30.- Number of dairy cattle, production, and exports of dairy products, New Zealand specified years, 1861-1930

Year	Cattle 1/		Production 2/		Exports 3/					
	Total	Dairy cows	Butter		Cheese	Butter	Cheese	Milk		
			Farm	Factory				and	pow-dered	Casein
Thou-sands	Thou-sands	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds		
1861	193	-	-	-	-	-	-	-	-	
1864	250	-	-	-	-	-	-	-	-	
1871	437	-	-	-	-	-	-	-	-	
1874	495	-	-	-	-	-	-	-	-	
1878	578	4/	-	-	-	348	338	-	-	
1881	699	4/	8,454	-	3,179	272	342	-	-	
1886	853	4/	12,171	-	4,595	2,596	1,840	-	-	
1891	789	4/	14,340	1,970	6,976	4,416	4,454	-	-	
1892	-	-	-	-	-	6,040	4,647	-	-	
1893	-	-	-	-	-	6,513	5,175	-	-	
1894	885	4/	-	-	-	6,806	6,233	-	-	
1895	964	257	-	-	-	6,492	8,595	-	-	
1896	1,048	276	-	5/11,337	5/9,684	7,992	7,994	-	-	
1897	1,138	300	-	-	-	11,088	8,700	-	-	
1898	1,209	324	-	-	-	10,842	7,696	-	-	
1899	1,203	334	-	-	-	15,242	7,777	-	-	
1900	1,222	355	-	-	-	19,329	11,519	-	-	
1901	1,257	372	-	29,758	15,645	22,578	11,681	-	-	
1902	1,362	381	-	-	-	28,448	8,372	-	-	
1903	1,461	429	-	-	-	31,952	8,375	-	-	
1904	1,594	468	-	-	-	35,208	9,467	-	-	
1905	1,737	498	-	-	-	34,246	9,919	-	-	
1906	1,811	518	-	51,819	16,807	35,865	14,695	-	-	
1907	1,852	544	-	-	-	36,785	26,525	-	-	
1908	1,816	541	-	-	-	25,757	31,449	-	-	
1909	1,773	537	-	-	-	35,964	44,868	92	-	
1910	4/	4/	-	-	-	39,952	50,614	236	-	
1911	2,020	634	-	60,687	53,100	33,867	49,187	282	-	
1912	4/	4/	-	-	-	42,349	64,632	32	-	
1913	4/	4/	-	-	-	41,693	68,506	17	-	
1914	4/	4/	-	-	-	48,616	96,743	48	-	
1915	4/	4/	-	-	-	47,056	91,533	1,175	198	

Continued

Table 30.- Number of dairy cattle, production and exports of
dairy products, New Zealand specified years,
1861-1930 - Continued

Year	Cattle 1/		Production 2/			Exports 3/			
			Butter			Milk			
						con-			
	Dairy:					densed:			
Total	cows	Farm	Factory	Cheese	Butter	Cheese	and	Casein	
							pow-		
							dered		
	Thou-	Thou-	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	sands	sands	pounds	pounds	pounds	pounds	pounds	pounds	pounds
1916	6/2,417	6/750	-	67,589	90,172	40,167	106,335	984	451
1917	2,575	777	-	-	-	28,492	99,203	4,106	5
1918	2,869	793	-	-	-	48,275	98,944	7,062	138
1919	3,035	826	-	57,018	118,058	38,732	176,099	10,495	-
1920	3,102	893	-	64,631	141,444	34,945	136,870	13,950	2,975
1921	3,139	1,005	-	92,926	124,953	100,630	153,304	18,596	3,704
1922	3,323	1,137	7/5,845	135,010	142,076	125,462	130,054	11,421	3,291
1923	3,481	1,249	7/6,261	176,562	139,775	140,016	161,444	16,220	5,632
1924	3,563	1,313	7/5,831	165,064	171,918	142,179	178,582	13,481	5,176
1925	3,504	1,323	7/6,201	135,053	160,893	139,476	154,196	13,743	4,918
1926	3,452	1,304	7/6,161	173,009	170,259	130,320	163,692	11,325	4,084
1927	3,258	1,303	7/6,401	194,502	175,199	163,020	167,193	12,420	5,237
1928	3,274	1,352	7/6,042	202,663	173,610	162,352	175,534	17,219	4,719
1929	8/3,446	1,371	7/5,984	222,680	199,611	185,225	199,258	13,736	6,369
1930	3,766	1,440	5,342	9/258,000	9/206,000	211,055	203,054	15,201	6,419

Compiled from New Zealand Official Yearbooks, except exports of powdered and condensed milk, which are from the International Institute of Agriculture, 1909-1923 and from the Monthly Abstract of Statistics of New Zealand, 1924-1926, New Zealand Yearbook, 1930.

1/ March 31.

2/ Year ended March 31.

3/ Calendar year.

4/ Not enumerated.

5/ According to special returns compiled by the Department of Agriculture the factory production of butter was 9,008,160 pounds and of cheese, 9,367,600 pounds.

6/ Census in October.

7/ Year ended January 31.

8/ Preliminary.

9/ Estimated on basis of increase in quantities forwarded to grading stores.

Table 31.- Production of butter and cheese, and estimated total production of milk in New Zealand 1922-1930

Calendar Year	Production			Production in terms of milk				Estimated
	Butter			Butter			Total	total
							butter	milk pro-
	Farm 1/	Factory	Cheese	Farm	Factory	Cheese	and	duction
	:	:	:	:	:	:	cheese	2/
	:1,000	:1,000	:1,000	:1,000	:1,000	:1,000	:1,000	:1,000
	:pounds	:pounds	:pounds	:pounds	:pounds	:pounds	:pounds	:pounds
1922	: 5,845	:135,010	:142,076	:122,745	:2,835,210	:1,420,760	:4,378,715	:4,865,239
1923	: 6,261	:176,562	:139,775	:131,481	:3,707,802	:1,397,750	:5,237,033	:5,818,926
1924	: 5,831	:165,064	:171,918	:122,451	:3,466,344	:1,719,180	:5,307,975	:5,897,750
1925	: 6,201	:185,053	:160,893	:130,221	:3,886,113	:1,608,930	:5,625,264	:6,250,293
1926	: 6,161	:173,009	:170,259	:129,381	:3,633,189	:1,702,590	:5,465,160	:6,072,400
1927	: 6,401	:194,502	:175,199	:134,421	:4,034,542	:1,751,990	:5,970,953	:6,634,392
1928	: 6,042	:202,663	:173,610	:126,882	:4,255,923	:1,736,100	:6,118,905	:6,798,783
1929	: 5,984	:222,680	:199,611	:125,364	:4,676,280	:1,996,110	:6,798,054	:7,553,393
1930 3/	: 6,000	:258,000	:206,000	:126,000	:5,418,000	:2,060,000	:7,604,000	:8,449,000

Compiled from New Zealand Official Yearbooks.

1/ Year ended January 31.

2/ Butter and cheese converted to terms of milk using the factors,
1 pound of butter = 21 pounds of milk and 1 pound of cheese = 10 pounds of
milk. Total butter and cheese in terms of milk is estimated to represent
90 per cent of total milk production.

3/ Estimated.

Table 32.-Dairy products: Exports from New Zealand, by commodity, and total in terms of milk, with percentage change from preceding year, 1891-1930 ^{1/}

Calendar year	Butter	Cheese	Condensed and powdered milk	Total dairy products in terms of milk equivalents	Quantity	Increase or decrease from preceding year
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds		Per cent
1891	4,416	4,454		137,276		-
1892	6,040	4,647		173,310		+ 26.2
1893	6,513	5,175		188,523		+ 8.3
1894	6,803	6,233		205,256		+ 8.9
1895	6,492	8,595		222,282		+ 8.3
1896	7,992	7,994		247,772		+ 11.5
1897	11,088	8,700		319,848		+ 29.1
1898	10,842	7,696		304,642		- 4.8
1899	15,242	7,777		397,852		+ 30.6
1900	19,329	11,519		521,099		+ 31.0
1901	22,573	11,681		590,948		+ 13.4
1902	28,448	8,572		681,128		+ 15.3
1903	31,932	8,575		754,322		+ 10.7
1904	35,208	9,467		834,038		+ 10.6
1905	34,246	9,919		818,356		- 1.9
1906	35,865	14,695		900,115		+ 10.0
1907	36,785	26,525		1,037,735		+ 15.3
1908	35,757	31,449		855,387		- 17.6
1909	35,964	44,863	92	1,204,568		+ 40.8
1910	39,932	60,614	236	1,346,364		+ 11.3
1911	33,867	49,187	292	1,205,051		- 10.5
1912	42,349	64,632	32	1,535,873		+ 27.5
1913	41,693	68,506	17	1,560,732		+ 1.6
1914	48,616	96,743	48	1,988,702		+ 27.4
1915	47,066	91,523	1,175	1,911,731		- 3.9
Year ended July 31						
1914-15	45,729	84,746	1,175	1,815,994		-
1915-16	45,418	106,706	984	2,027,726		+ 11.7
1916-17	38,057	92,407	4,106	1,752,009		- 13.6
1917-18	45,398	105,923	7,062	2,072,522		+ 18.3
1918-19	46,507	137,193	10,495	2,422,042		+ 16.9
1919-20	30,333	131,382	13,950	2,348,463		- 3.0
1920-21	71,531	160,912	18,596	3,241,443		+ 38.0
1921-22	109,236	144,338	11,421	3,817,283		+ 17.8
1922-23	144,166	146,684	16,220	4,607,866		+ 20.7
1923-24	127,794	164,108	13,481	4,419,121		- 4.1
1924-25	150,785	161,504	13,743	4,877,726		+ 10.4

Table 32.- Dairy products: Exports from New Zealand, by commodity and total in terms of milk, with percentage change from preceding year, 1891-1930 1/ - continued

Year ended	Butter	Cheese	Condensed and powdered milk <u>2/</u>	Total dairy products in terms of milk equivalents	Increase or decrease from preceding year
	: 1,000 pounds:	: 1,000 pounds:	: 1,000 pounds:	: 1,000 pounds:	: Per cent
1925-26	: 129,580	: 161,535	: 11,325	: 4,415,785	: - 9.5
1926-27	: 147,593	: 171,637	: 12,420	: 4,902,763	: + 11.0
1927-28	: 166,177	: 167,528	: 17,219	: 5,285,530	: + 7.8
1928-29	: 174,337	: 184,760	: 13,736	: 5,604,829	: + 6.0
1929-30 <u>3/</u>	: 206,949	: 192,226	: <u>4/</u> 14,000	: 6,366,189	: + 13.6

Exports of separate products as published in New Zealand Official Yearbooks and Monthly Abstract of Statistics.

1/ In terms of estimated milk equivalent assuming 1 lb. butter = 21 lbs. milk; 1 lb. cheese = 10 lbs. milk; and 1 lb. condensed and powdered milk averages 7 lbs. milk.

2/ Principally powdered.

3/ Preliminary figures as reported by American Vice Consul, Wm. P. Cochran, Jr., Wellington, August 25, 1930.

4/ Estimated.

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